Division of Domestic Work: Is There Adjustment Between Partners when One is Unemployed?

Evidence from French couples

ANNE SOLAZ*   solaz@ined.fr
INED, 133 Bld Davout, 75 980, Paris cedex 20, France

Abstract.   Coming back to the main models of division of work within the couple, the aim of this article is to analyze the possible transfers of domestic chores between partners facing an external shock. We test it by studying the allocation of domestic time on couples facing unemployment on the French time-use survey. Are domestic chores transferable between partners? Controlled for many covariates, bivariate tobit regressions on indicators of time, variety and number of activities show that domestic tasks performed by unemployed people, either men or women, increase. Despite the inertia due to couple's specialization, the hypothesis of versatility is partially checked. "Dominantly Feminine tasks" are the more transferable tasks. Unemployment involves a new division of labor between spouses.

Keywords: division of labor, specialization, household production, unemployment, family

JEL Classifications: D13, D19, J12, J19

« The wife is the breadwinner while her husband stays at home to look after the children and to do the cooking and cleaning...In Manchester alone there are many hundreds of men who are condemned to perform household duties. One may well imagine the righteous indignation of the workers at being virtually turned into eunuchs » (Friedrich Engels, 1845).

This excerpt, quoted by Nancy Folbre (1993), is taken from a work by Engels published in 1845 on the conditions of the working class in England. In this work, the author studies the consequences of unemployment on family life, laying particular emphasis on how the traditional gender-based division of labor and the resulting roles are reversed when men are financially dependent on their partners. As this example shows, the question of unemployment's effect on marital life is not entirely new.

The unequal allocation of household tasks is considered as a result – and cause – of gender relations in society. Gender differences in wages in the labor market are one explanation for women's specialization in home production. The economic

theory of marriage attributes a great deal of significance to this division of labor, which represents one of the advantages of living together as a couple, next to the sharing of risks (Yoram Weiss, 1997). Most research on the distribution of domestic tasks has focused on their unequal distribution among men and women, and the impact of the birth of a child on each partner's specialization. Marie-Agnès Barrere-Maurisson (1992) and Cécile Brousse (2000) have shown that in France the birth of a child disrupts the division of time between home and work and increases inequality in the respective participation of men and women.

Unemployment is another factor that disrupts the division of labor between home and work. It suddenly cuts down the working hours of one of the spouses and results in a drop in the household's income. In the case of unemployment, a couple may revert to the traditional pattern of specialization, whereby one spouse is financially dependent on the other. In that case, how are these tasks distributed among household members? Are compensation strategies elaborated? Do unemployed persons offset joblessness by increasing their participation in domestic tasks, or does this participation remain the same, or even decrease?

The aim of this study is to analyze the impact of unemployment on the distribution of domestic tasks between spouses. First, the issue must be considered in the theoretical light of household economics, according to which one of the main advantages of marital life lies in the household productivity gains resulting from specialization between the partners. Then, we contemplate the hypothesis of transfers between partners. The situation of couples with one unemployed partner provides an ideal framework to test if specialization resists to an external shock. Are there adjustments to the usual distribution of domestic tasks when one partner faces unemployment? Are unemployed partners more versatile? Do they substitute for the other partner in domestic labor? A comparative study of the distribution of domestic tasks between partners, according to their occupational situation, was conducted on the basis of the 1998–1999 *Emplois du Temps* ("Time use") French survey.

1. Division of domestic work

Whereas the sphere of couple's specialization is now reduced, specialization still exists and could imply "inertia" to an external shock such as unemployment. We define the inertia of couple's specialization as the "non-adjustment" of work division to a shock that could affect it. Couple specialization models, including the possibility of a corner solution where one partner works only in the labor market and the other only at home, has been analyzed (e.g., Gary Becker, 1965; Reuben Gronau, 1977, 1997; Gillian Hadfield, 1999; Shelly Lundberg and Elaina Rose, 1998). According to these unitary models and Nash-inspired negotiation models such as those presented by Anne Bustreel (2001) the members of a family allocate their time according to their comparative advantage in the production of market or non-market goods.[1] Specialization enables the household to take advantage of economies of scale in its production function and to save time and money. In addition, Joyce Jacobsen (1998)

lists two more advantages of specialization: gains in terms of coordination and transaction costs, and gains in terms of skills, since each person becomes more skilled in his or her specific tasks.

Whereas the advantages of in-couple specialization seem obvious for a couple taken as a unit, they are not necessarily so for each member taken individually. A major criticism of Becker's specialization model from a feminist perspective pertains to the misleading symmetry between both parties.[2] Given that men's work in the labor market is valued more than women's work at home, specialization becomes a source of inequality between partners.

Moreover, assuming that one of the partners invests his/her spouse-specific capital in domestic tasks while the other invests in the market sector, specialization involves the process of unlearning the activities one has given up. Specializing in domestic tasks may optimize current household production, but it implies an individual cost, since it involves a loss of economic independence and consequently of negotiating power.

The "gender norm" approach is an alternative to economic theories of specialization. It places gender and sex-role attitudes at the heart of the relation and work division within partners: specialization is seen as a consequence of gender relations (see Julie Brines, 1994). One illustration of this approach is the result of Bernard Zarca's study (1990) showing that men and women express greater dissatisfaction at having to perform tasks traditionally attributed to the other sex. The separate spheres model of Shelly Lundberg and Robert Pollak (1993) was one of the first to explicitly take gender roles into account and to allow different distributions in existing marriages according to which partner is given a cash transfer payment.

Furthermore, growing uncertainty in family and labor market situations does not encourage specialization which, in order to be efficient, must be supported by a long-term relation. Increases in divorce rates make it increasingly worthwhile to live a single lifestyle, whereby an individual performs most domestic tasks. In Amyra Grossbard-Shechtman's (1984) model, which interrelates labor and marriage markets, individuals continue to make their own decisions of allocation of time between work in the labor market, household production, and leisure, on their own before, during, and after marriage.

The rise in unmarried households (with weaker separation costs) reduces the incentive to specialize (Olivia Ekert-Jaffé and Catherine Sofer, 1991; Sofer and Michel Sollogoub, 1992). In this sense, Bustreel (2001) developed a non-cooperative model in which the non-division of labor may be an optimal choice if the risk of separation increases.

The rising uncertainty in labor situations (rise of unemployment, temporary jobs) also makes specialization of household roles very risky nowadays (Valerie Oppenheimer, Kalmijn Matthijs, and Lim Nelson, 1997). The participation of both partners in the labor market allows greater flexibility, should a problem arise in the future (Ekert-Jaffé Olivia and Anne Solaz, 2001). Instability could involve changes in work division, and as a result specialization in household production is much less profitable.

In recent years, the scope of specialization has been reduced and households with complete specialization are increasingly being replaced by dual-earner couples. Increasingly, domestic tasks have their market equivalent (childcare and care for the elderly, ... etc). Nancy Folbre and Julie Nelson (2000) speak of changes in the social contract: whereas traditionally, the "public" sphere belonged to men and the private sphere to women, now that women have access to the labor market, domestic tasks are increasingly performed in exchange for monetary compensation. Domestic tasks are now less numerous and less specialized. As a result, they are more easily transferable among spouses.

As the domestic workload decreases, so does the number of tasks that can be shared. With the increasing frequency of dual-earners couples, division of labor consists less often of one partner working in the market sector and the other in the home sector. It is more often the result of a choice made by both partners. Models of labor supply that respond to this trend by including time in household production as a third element (in addition to work and leisure) include Gronau (1977), a unified model, and more recent collective models where each partner's amount of time spent on household production is the object of in-couple negotiations (Patricia Apps and Ray Rees, 1997; Pierre-André Chiappori, 1997; Thomas Aronson, Sven-Olov Daunfeldt, and Magnus Wiksrtom, 2001; Benoit Rapoport, Sofer, and Solaz, 2003, forthcoming).

The following analysis focuses on the domestic sphere, given both partners' choice to work in the labor market[3].

2. The impact of unemployment

Unemployment is a situation that entails a change in the habitual distribution of domestic tasks, since budgetary constraints are higher but time constraints are lower. Our aim is to analyze the distribution of domestic tasks, in terms both of quantity (time spent and number of activities) and quality (type of task), among couples where one of the partners is unemployed. We take as many discriminating factors as possible into account in order to determine whether domestic duties are transferred from one spouse to the other if one is unemployed.

Most of the above-mentioned theories suggest that readjustment of the division of labor in response to an exogenous shift will be limited, and that the adjustment would be easier for women. Whether specialization is considered as an efficient way of sharing time (that is to say a way to save time spent on domestic chores) or as the expression of gender relations, it seems that existing specialization would tend to reduce the impact of unemployment.

The traditional "specialization" theory suggests that adjustments will be limited due to differences in comparative advantage and acquired skills; individuals require time to adjust. This implies that the duration of unemployment may have a significant effect, but unfortunately, it can not be tested with the data available[4]. Since women mainly have a more versatile "skill set" (since they are working both in the

domestic and labor fields and they are mainly performing domestic tasks), they are bound to adjust more easily than men.

The bargaining and "feminist" approaches suggest that adjustments will be limited due to men's larger long-term bargaining power. For instance, they have more expected lifetime earnings. They are then able to resist adjustments their female partners might like to see, such as doing sufficient domestic work while unemployed, and allow the wife to reduce her domestic work. Again, women would adjust more readily than men because they have less bargaining power.

Furthermore, the "gender norms" approach suggests that adjustments will be limited because men and women are just accustomed to doing certain things and habits are hard to change. Women feel uncomfortable reducing their non-market work very much just and let men do more; this threatens their "gender identity".

Thus, in all three cases, unemployment is creating pressure for change that meets resistance, but always less for women than men.

Furthermore, since specialization is risky and its sphere reduced, the impact of unemployment should also be weak.

We are now going to answer the following questions: Is unemployment a change large enough to have an impact on the division of domestic tasks? Is the impact different depending on whether the man or the woman is unemployed? If there is an impact of unemployment, does that imply lower productivity? For instance, is the amount of time devoted to meal preparation doubled for the same number of meals? Does the unemployed person relieve his or her spouse of some of the burden? Does s/he perform new tasks?

3. The model

3.1. How can adjustment between partners be verified?

A couple's possible response to unemployment could be an adjustment in time allocation. In this sense and in contrast with the inertia involved in specialization, we define the "versatility" and the "substitutability" of partners.

By versatility, we mean the ability of both spouses to invest in domestic tasks and perform the household duties of the other if need be. Several elements support the hypothesis of versatility. Partners may in fact wish to perform different tasks (Gronau Reuben and Daniel Hamermesh, 2001). Doing the same tasks over and over again can become tiresome, and the more frequent the task, the more it will be perceived as being unpleasant (cf. appendix 3 on diversity of tasks). In addition, a couple's aim of living together is to maximize the time spent together (Daniel Hamermesh, 2002), especially joint leisure time. Thus, household tasks which do not depend on a specific schedule should be performed by the spouse who has more free time during the working time of the other. The latter's workload thus decreases and more time is gained for joint leisure activities[5].

Being substitutable for domestic production is a stronger assumption since it means that partners are really interchangeable (via their participation in terms of time and number of domestic tasks). This can be expressed as follows:

If T_h is the man's time devoted to domestic work, T_f is the woman's time devoted, and T is the total time that the couple devoted to these tasks ($T = T_h + T_f$), we have:

$$\ln T_h = \gamma_h \text{unem}_h + \chi_h \text{part}_h + \lambda_h \text{olf}_h + \delta_h \text{unem}_f + v_h \text{part}_f + \eta_h \text{olf}_f + X'\beta_h + u \tag{1}$$

where part_h, olf_h, and unem_h (respectively part_f, olf_f, and unem_f) are dichotomous variables representing the situation of the man (respectively of the woman) in the labor market: these variables are worth one if the person works part time, is out of labor force, or is unemployed. The reference modality is full-time work. X is a vector of socio-demographic characteristics.

The system of equations is:

$$\begin{pmatrix} \ln T_h = \gamma_h \text{unem}_h + \chi_h \text{part}_h + \lambda_h \text{olf}_h + \delta_h \text{unem}_f + v_h \text{part}_f + \eta_h \text{olf}_f + X'\beta_h + u_h \\ \ln T_f = \gamma_f \text{unem}_h + \chi_f \text{part}_h + \lambda_f \text{olf}_h + \delta_f \text{unem}_f + v_f \text{part}_f + \eta_h \text{olf}_f + X'\beta_f + u_f \end{pmatrix} \tag{2}$$

Our hypothesis of substitutability of time can be expressed in three propositions as follows:

– the man's unemployment has the same impact as the woman's on the couple's total time devoted to domestic tasks (equation 1). An exogenous shock in the labor market has the same impact on the housework production whether it affects the man or the woman . This possible symmetry between man and woman is a first test of flexibility in housework organization.

$$\gamma \cong \delta \tag{Hypothesis 1}$$

– a less restrictive hypothesis states that female and male unemployment have the same impact on total domestic time, in proportion to the average participation in domestic tasks of men and women in our society. We want to avoid comparing directly male and female participation of the unemployed without taking into account traditional inequality in the domestic work division. This means that if men devote, on average, x times less time than women to domestic tasks, we test if unemployed men also participate X times less than unemployed women in the couple's domestic production. In this case,

$$\gamma \cong \delta \frac{(1 - \theta)}{\theta} \tag{Hypothesis 2}$$

with θ (respectively $1 - \theta$) being the average participation of the man (the woman) in the couple's total domestic time.

– Lastly, we test the versatility of partners: If the woman is unemployed, then the time devoted by the man to domestic tasks decreases, which means that the unemployed woman relieves her husband of part of his tasks. This implies:

$$\delta_h < 0 \hspace{5cm} \text{(Hypothesis 3a)}$$

– symmetrically, if the man is unemployed, the domestic workload of the woman decreases, which means that the man relieves his partner of part of her household tasks, implying:

$$\gamma_f < 0 \hspace{5cm} \text{(Hypothesis 3b)}$$

Hypotheses 1 and 2 focus on flexibility (how total domestic production time is allocated between partners when one of them is submitted to an exogenous shock), whereas hypotheses 3a and 3b concern the possible versatility of partners (Is one partner able to and does he perform the tasks usually performed by the other when there is such exogenous shock).

We will also verify our four hypotheses with an indicator pertaining to the number of tasks performed, instead of indicators pertaining to the time devoted to such tasks, summarized by these three questions:

– is the number of domestic activities performed by the couple the same whether the man or the woman is unemployed (in absolute values and proportionally to their average participation)?
– do the number of tasks performed by the man decrease when the woman is unemployed?
– do the number of tasks performed by the woman decrease when the man is unemployed?

3.2. Econometric problems

This model raises three main econometric problems. The first is the presence of numerous domestic times that are equal to zero. Using a *tobit* model can help us to avoid this problem by modeling the participation (or non-participation) in domestic tasks on the day the booklet was filled, and in that case, the amount of time devoted to these tasks.

The second problem is the possibility that the situation in the labor market is endogenous. If endogeneity seems obvious in the case of persons who are out of labor force (the fact of not working can be the result of a choice prompted by an increased workload on the domestic front, for instance to take care of children), it is not the case for unemployed (item of interest), even if it remains possible. In contrast

to "out of labor force", in French surveys, "unemployed", implies that the person is actively seeking work. Answers to several specific questions addressed to unemployed persons in the survey confirm that it is the case[6].

Another problem raised by the cross sectional nature of the data is that unemployed people may be self-selected into this state and hence not be representative of other individuals. In that case, the selection bias could affect our results. To investigate the self-selection issue in depth, we estimated the probability of being unemployed. Results show that except for traditional covariates such as education, age, and marital status, which are already in our models, no other variables explain the probability of unemployment. In particular, the number and age of children as factors of risk are not significant. Only one characteristic of the environment, namely the unemployment rate, increases the likelihood of unemployment. Being unemployed in France in the nineties seems to result from a bad economic situation rather than a selection bias. The unemployment rate was quite high (12.2% in 1998) during the survey period.

All these remarks tend to minimize the possibility of voluntary unemployment that would imply endogeneity or selection bias problems.

Lastly, a strong correlation can be established between the domestic time of men and women. For this reason, we estimate a *bivariate* tobit model of the time that men and women simultaneously allocated to household tasks (cf. appendix 1).

We estimated these models with a sample of couples taken from the Time-Use survey conducted by INSEE in 1999 (cf. appendix 2 for a description of the survey and the sample used).

3.3.   Covariates

Many factors can influence this division of household tasks, and even if we introduce a large number of variables and indicators, only a relatively small part of the observed variability can be explained. This is in part due to the difficulty of gathering information on these activities owing to their private nature (Thomas F. Juster and Frank P. Stafford, 1991) and also to a number of explanatory factors which are linked to personal or family preferences, and are difficult to perceive (greater or lesser demand for cleanliness, preference for home-cooked food, dressing and eating habits that demand more or less time, etc.). Tobit regressions (or simple linear regressions, if the data is not censored) were carried out with various indicators in order to determine the specific impact of the variables of interest, namely the occupational status of each partner.

The variables of interest are the occupational status of each partner: employed full-time, employed part-time[7], unemployed, and out of the labor force. People in full-time employment are used as the reference group.

We control for the woman's educational level (highest diploma), the socio-occupational category, and the man's age[8]. The age makes it possible to measure generational changes in attitudes, with younger generations adopting a less traditional

division of tasks. Woman's education also has an impact on the individuals' attitudes and values, a higher level of education encouraging a more egalitarian division of tasks (Joni Hersch and Leslie Stratton, 1994). We also introduced the number of children as well as the presence or absence of children under the age of three (as is well-known, these require a large amount of domestic time), and the day the booklet was filled in (week-day or week-end). It can be assumed that the housework time spent by the two partners falls as income increases, insofar as high income levels make it possible to buy market substitutes for domestic production. We introduce both the couple's income and a dummy variable representing whether or not the couple hires external household help.

We can also assume that the type of dwelling can affect the amount of work in home production, so we control for some home characteristics: type of dwelling (single-family house, apartment in a small building, apartment in a large building), number of rooms, property status (owner, tenant, etc.), and location (small town, big city, etc. . .).

Age differences and potential wages differences between partners may indicate a strategic advantage in favor of the older and the higher earner of the two (Dominique Anxo, Lennart Flood, and Yusuf Kocoglu, 2002). Differences in age and potential wage have been tested as indicators of power within the couple. Potential wages(ln) for each partner have been estimated as a function of age and squared age, level of education, local situation, marital status, country of birth, and number and age of children.

4. Results

4.1. Typology of household tasks

As housework is traditionally shared according to social norms and gender role attitudes, we distinguish three types of tasks first determined on the basis of Zarca's typology (1990), and referred to by Brousse (2000): those performed mostly by women, those performed mostly by men, and those that are more or less shared. If the task is performed mostly (more than 60% of the time) by women, the task is qualified as being a "dominantly feminine" task, and if this type of task is performed mostly by men (over 60% of the couple's time), then it is termed a "dominantly masculine" task, and if the share of the man lies between 40% and 60%, then the corresponding task is called a "mixed" task[9].

The survey lists nearly 140 different tasks, among which 51 are domestic tasks, the others being professional, physiological, and leisure tasks. For instance, the "kitchen" theme includes the preparation and cooking of meals, dishwashing and cleaning up, setting and clearing the table, baking, making jam and preserves, and cooking for another household, representing five different activities. Before applying this typology, we drew up a classification of domestic tasks in 14 categories.

Table 1. Man's share of domestic time (when the total household time is not null) according to activities in the total sample (standard errors).

Number of couples	Total sample	
Total part	3405	
Mean man's share in:	0.3397418	Task dominantly
Preparation and cooking of meals	22.71% (0.289)	Feminine
Cleaning	16.2% (0.162)	Feminine
Clothes (laundry, ironing, . . .)	10.44% (0.104)	Feminine
Shopping	41.76% (0.410)	Mixed
Accounts others	53.98% (0.470)	Mixed
Administration	56.34% (0.463)	Mixed
Repair, Odd jobs	90.67% (0.256)	Masculine
Children care	20.28% (0.295)	Féminine
Games, homework	37.09% (0.418)	Féminine
Animals, Pets	53.94% (0.443)	Mixed

Sewing tasks, taking care of persons other than children, gardening and time for filling the survey questionnaire are not represented in the table because they are too scarce but they are nevertheless counted in total statistics. The first two are obviously dominantly feminine, whereas the third is dominantly masculine and the last mixed.

Source: Survey « Emplois du temps 1998–1999 » (INSEE).

The result is the synthetic classification shown in Table 1. This division of labor does not undermine stereotypes since the "dominantly feminine" tasks are those linked to the kitchen, housework, and laundry, while the "dominantly masculine" activities are gardening and odd jobs. Paperwork, shopping, and caring for pets are just about equally shared, on average. From now, we will use the terms "feminine, masculine, and mixed tasks" as part of this classification.

4.2. *Unemployed persons perform more domestic tasks*

These overall averages mask individual differences. Figure 1 shows time spent on domestic tasks, according to the spouses' occupational situation[10]. An unemployed person has more free time and as a result the time s/he devotes to domestic tasks increases. Thus, the total amount of time a couple devoted to household tasks increases considerably if one of the spouses is unemployed (see Figure 1 and Appendix 4 for amounts), compared to couples whose members are both working: time spent increases from 377 min to 509 if the man is unemployed, to 468 if the wife is unemployed, and 590 if both are unemployed. If we look at the time devoted by each partner, it is mainly that of the unemployed partner which increases. However, we observe that if unemployed men spend more time performing domestic tasks, the workload of their partner does not decrease for that matter. It even seems to increase: the average time spent on domestic activities by women living with

Figure 1. Total time devoted to domestic tasks.

unemployed men (303 min) is higher than the average amount of time spent by women living with an employed man (252). Unemployed women also increase the time they allocate to domestic tasks, but their husbands reduce theirs (from 123 to 106).

This unequal situation can be interpreted in different ways. It is possible that unemployment reduces recourse to paid domestic help, such as cleaning help and baby-sitters, especially if the man is unemployed. The average wage of men being higher than that of women, the loss of income due to the man being unemployed tightens the couple's budgetary constraints, and external help is no longer affordable. One can also imagine that the new distribution of tasks represents a more profound change when the man is unemployed. Indeed, since most domestic tasks are usually performed by women (two thirds of total domestic time), the fact that the man is unemployed means that the new division of tasks will be very different from the usual model. The situation may require a gradual adaptation, either because the wife does not immediately transfer her domestic tasks (possibly because she may feel guilty about seeing her partner carry out a greater share of the tasks), or because the man must learn to perform these new tasks (the wife may not like the way her husband performs such and such task). Lastly, these consequences also reflect social and cultural factors which are difficult to pinpoint by comparing averages. Finally, this quite paradoxical result supports Brines' criticism (1994) of the symmetrical processes in the models based on the dependency hypothesis.[11] Here, the allocation is not efficient and does not result from a bargaining model, but results from social and ''gender norms'' which are the heart of the exchanges.

Nonetheless, if we refer to the typology established above in section 4.1[12], it appears that the type of tasks that unemployed men perform during their additional free time are mainly feminine tasks or mixed tasks, all the more so if their wife is economically active (and not unemployed). However, the time devoted to feminine tasks (Figure 2) and mixed tasks (Figure 3) by spouses of unemployed men increase from 185 and 57 min respectively, for employed women married to employed men, and to 223 and 67 min for employed women married to unemployed men. One possible explanation is parental time. Indeed, Ariane Pailhé and Anne Solaz (2004) showed that parental time was not easily transferable between partners. It seems that each partner (and more so women than men) wishes to preserve his or her parental
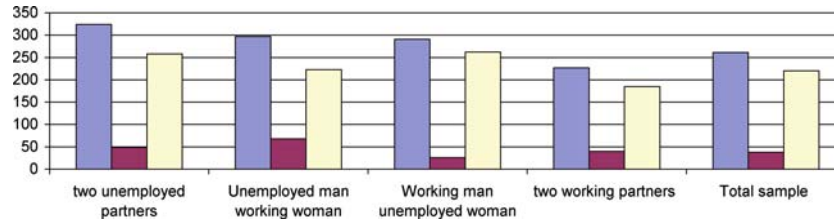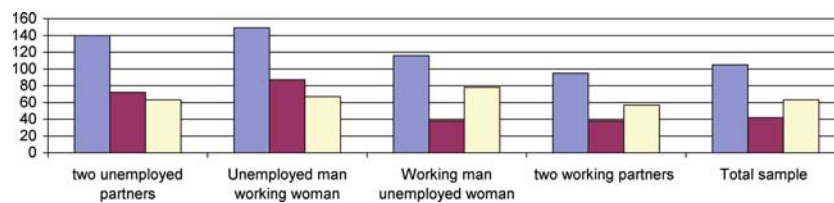
Figure 2. Time devoted to feminine tasks.

Figure 3. Time devoted to mixed tasks.

activities (especially the more valuable and emotionally invested tasks such as children's education and leisure with children) even if the other partner has more time to devote to them and does spend more time with them, because parental time also reflects his/her desire to contribute to the common good, represented by the child.

The figures for dominantly masculine tasks (Figure 4) concern specialized activities (gardening and odd-jobs). These tasks being more occasional than the feminine and mixed tasks, it is difficult to draw conclusions. However, we may observe that the average time devoted to masculine domestic tasks by unemployed men and women is higher than that of employed men and women. The reason can be attributed to social class rather than to the situation of being unemployed. Indeed, members of the working class are more strongly affected by unemployment and are more likely to perform gardening and odd jobs themselves, given their higher degree of manual competence and lower income which makes it difficult to afford hiring someone else to do the job.
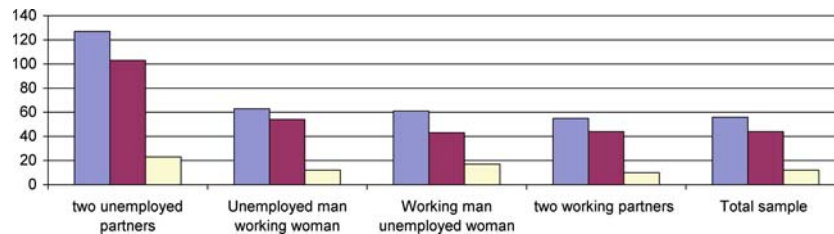

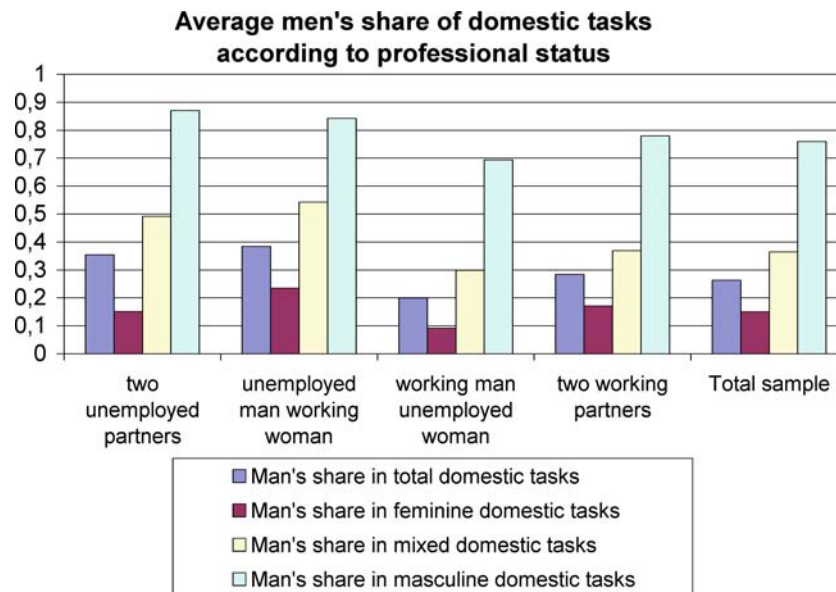*Figure 4*. Time devoted to masculine tasks.

Figure 5. Average men's share of domestic tasks according to professional status. *Source* : Survey « Emplois du temps 1998–1999 » (INSEE).

Overall, the average share of men in the couple's total time devoted to domestic tasks (Figure 5) is higher when they are unemployed (38% of the total number of tasks), and lower when the women are unemployed (20%).

When the professional situation of both partners is the same (both working or both unemployed), the proportion of male participation in dominantly female tasks remains the same and represents 15% of the total number of tasks performed. In contrast, the share of men in mixed tasks is much higher when they are unemployed, regardless of the situation of their partner: in that case they carry out 50% of mixed tasks, as opposed to only 30% when they are working.

The comparisons between averages according to occupational situation encouraged us to carry out more precise analyses, in order to test our model. Does the observed impact of unemployment remain significant when we take into account a group of variables influencing time use and the distribution of domestic tasks between partners?

4.3. Controlled variables

Before going on with our analysis, let us make a brief comment on the impact of these control variables on the domestic time of men and women (Table 2).

The higher the couple's income, the less time they devote to domestic tasks. Time spent by women is particularly dependent on the income factor. It is assumed that

Table 2. Effect of control covariates on the log of man and woman's domestic time.

Bivariate tobit model	Model 1		Model 2	
Domestic time of	Man (T)	Woman (T)	Man (T)	Woman (T)
Household income (in Francs)				
< 7000	−0.047 (−0.50)	0.066 (1.06)	−0.071 (−0.76)	0.075 (1.19)
7000–10000	−0.078 (−1.20)	**0.078** (1.79)	−0.093 (−1.42)	0.079 (1.82)
10000–14000	0 (ref)	0 (ref)	0(ref)	0(ref)
14000–17500	−0.038 (−0.67)	−0.021 (−0.54)	−0.070 (−1.20)	−0.030 (−0.79)
17500–21000	0.049 (0.74)	0.040 (0.90)	−0.010 (−0.15)	0.026 (0.61)
21000–35000	−0.021 (−0.31)	**−0.113** (−2.40)	**−0.127** (−1.85)	**−0.126** (−2.77)
> 35000	**−0.355** (−3.17)	**−0.258** (−3.46)	**−0.520** (−4.60)	**−0.280** (−3.75)
Domestic help (dummy)	0.041 (0.55)	−0.037 (−0.75)	0.001 (0.01)	−0.047 (−0.93)
Number of children	0.027 (1.46)	**0.085** (6.80)	**0.043** (2.20)	**0.083** (6.35)
child under three (dummy)	**0.178** (3.24)	**0.313** (8.58)	**0.154** (2.76)	**0.316** (8.55)
Woman's education (diploma)				
University 2nd level	0.085 (1.05)	−0.078 (−1.46)		
University 1st level	0.044 (0.63)	0.005 (0.12)		
Secondary	0 (ref)	0 (ref)		
Vocational	−0.000 (−0.00)	0.055 (1.40)		
Primary, no diploma	−0.052 (−0.79)	**0.088** (1.97)		
Man's Social class				
Worker	0.019 (0.29)	−0.031 (−0.72)		
Medium level profession	0 (ref)	0 (ref)		
Employee	−0.087 (−1.26)	−0.059 (−1.29)		
Manager	**−0.205** (−2.58)	0.020 (0.38)		
Farmer, tradesman	**−0.438** (−5.22)	−0.036 (−0.64)		
Woman's potential estimated wage (in thousands of francs)			**0.202** (1.71)	0.003 (0.49)
Man's age				
20–34 years old	−0.044 (−0.80)	−0.053 (−1.44)	−0.005 (−0.09)	**−0.71** (−1.91)
35–44 years old	0 (ref)	0 (ref)	0 (ref)	0 (ref)
45–55 years old	−0.019 (−0.39)	0.052 (1.61)	−0.041 (−0.84)	**0.062** (1.94)
More than 55 years old	0.073 (0.93)	0.054 (1.04)	0.031 (0.40)	0.067 (1.31)
Week day (dummy)	**−0.505** (−12.55)	**−0.136** (−5.08)	**−0.497** (−12.26)	**−0.137** (−5.11)
Dwelling				
Individual house	**0.155** (2.24)	**0.075** (1.65)	**0.157** (2.26)	**0.080** (1.75)
Flat in a less than ten-flat building	0 (ref)	0 (ref)	0 (ref)	0 (ref)
Flat in a ten-flat or more building	−0.020 (−0.28)	0.017 (0.36)	−0.014 (−0.20)	0.022 (0.47)
Town size				
Villages	−0.022 (−0.34)	0.007 (0.17)	−0.023 (−0.36)	0.009 (0.21)
Little towns (less than 20000 habitants)	**−0.141** (−2.07)	−0.024 (−0.52)	**−0.152** (−2.23)	−0.019 (−0.42)
Paris and large cities	−0.072 (−1.15)	0.017 (0.40)	−0.094 (−1.49)	0.016 (0.38)
Medium cities (from 20000 to 100000 habitants)	0 (ref)	0 (ref)	0 (ref)	0 (ref)

Table 2. Continued

Bivariate tobit model	Model 1		Model 2	
Domestic time of	Man (T)	Woman (T)	Man (T)	Woman (T)
Suburbs of Paris	0.031 (0.41)	−0.018 (−0.35)	−0.034 (−0.43)	0.003 (0.06)
Number of rooms	−0.0125 (−0.68)	**0.022** (1.82)	−0.025 (−1.38)	**0.220** (1.80)
Ownership of the dwelling (dummy)	0.060 (1.21)	**0.055** (1.69)	0.040 (0.80)	0.052 (1.61)
Correlation	0.093		0.092	

Bold characters mean significantly different from the reference modality at 10%.

Source: Survey « Emplois du temps 1998–1999 » (INSEE).

this income effect reflects the fact that certain tasks are externalized, i.e., by hiring childcare, purchasing ready-made food, or eating out. The number of children raises the mother's domestic workload but has no impact on the father's. In contrast, the presence of a child under the age of three significantly increases the domestic work time of both parents. Thus, fathers of small children participate most in housework. The educational level of women does not have any impact on the participation of men, but the domestic workload of women with a very low educational level is heavier. The couple's income being equal, these findings indicate that the human capital of women increases their power of negotiation within the family and enables them to reduce the amount of time devoted to housework.

The occupational groups least involved in domestic tasks are, on the one hand, executives and, on the other hand, farmers and shopkeepers. As far as the generation effect is concerned, it is determined by the age of the man. For a given demographic situation (age and number of children), there is no impact on men's domestic time, but women's time is reduced if they are younger (result more significant in model 2).

This leads us to believe that the general decline in the unequal distribution of tasks is due to the lesser participation of younger women rather than to the greater participation of younger men.

Lastly, both men and women perform more domestic tasks on weekends and if they live in a single-family house rather than in an apartment. The domestic workload increases with the number of rooms, but it is not influenced by the location or ownership status of the dwelling.

Concerning our bargaining indicators, we found that neither age differences nor potential wage differences have a significant impact on the sharing rule of domestic work. Directly introducing potential wages of each partner raised some correlation problems since the variables used to estimate them are mainly the ones of our regression (diploma and age are the best predictors of wages). We have dropped these variables from the regression with male and female potential wages (model 2). The woman's potential wages have a slight positive impact on male participation. It increases that participation, which is consistent with the hypothesis according to which female earnings or potential female earnings are one expression of their bargaining

power, and then increases man's participation in the common domestic work. But both potential wages have no impact on female participation. This result emphasizes the "independence hypothesis" of the economic models of divorce and couple's dissolution. It suggests that female potential wage plays the role of a threat point.

For the sake of clarity, we now only report results pertaining to the occupational situations of men and women, but all the models take into account the factors listed above. Since the results in model 1 and 2 are similar for the variables of interest (see results of model 1 and 2 for total domestic in Table 4) in all estimated regressions, we will mainly comment on the results of model 1.

4.4.   The domestic time of the couple

The aim is to verify our first hypotheses (1 and 2) concerning substitutability. Does unemployment have the same impact whether it affects the man or the woman (in proportion to their average participation)?

Table 3. Regression on the domestic time (ln) of the couple according to type of tasks.

Professional situation	Couple's domestic time			
	Total	Feminine	Mixed	Masculine
Man	Coef (T)	Coef (T)	Coef (T)	Coef (T)
Unemployed	**0.134** (2.92)	0.015 (0.26)	**0.577** (3.71)	−0.316 (0.74)
Insecure job	−0.043 (−0.95)	−0.034 (−0.62)	−0.018 (−0.12)	−0.267 (−0.64)
Secure job	0 (ref)	0 (ref)	0 (ref)	0 (ref)
Part time	0.044 (0.62)	−0.054 (−0.61)	**0.254** (2.36)	0.766 (1.18)
Inactivity	**−0.147** (2.34)	0.075 (0.97)	**0.557** (4.81)	−0.823 (−1.42)
Woman				
Unemployed	**0.301** (7.15)	**0.308** (5.92)	**0.296** (1.75)	**1.013** (2.65)
Insecure job	−0.012 (0.29)	0.019 (0.38)	−0.118 (−0.71)	−0.60 (−0.16)
Secure job	0 (ref)	0 (ref)	0 (ref)	0 (ref)
Part time	**0.081** (2.78)	**0.095** (2.64)	0.250 (0.95)	−0.180 (−0.67)
Inactivity	**0.325** (10.36)	**0.343** (8.84)	**0.490** (2.12)	**0.626** (2.18)
Hypothesis 1:	Rejected	Rejected	Accepted	Rejected
Male and female unemployment have the same impact	*No*	*No*	*yes*	*no*
Hypothesis 2:	Accepted	Not testable	Accepted	Not testable
Male and female unemployment have the same impact, in proportion to their average participation in society	*Yes* [a]		*yes* [a]	

Controlled for age, social group of man, education of woman, income, number and age of children of the household, day of interview, domestic help, dwelling characteristics.

Bold characters mean significantly different from the reference (ref) modality at 10%.

[a]coefficients not significantly different from zero.

Source: Survey « Emplois du temps 1998–1999 » (INSEE).

The overall time devoted to domestic tasks for couples with one unemployed spouse –whether husband or wife—is higher than that of couples with two employed partners. The regression performed on the overall time (Table 3) confirms this fact. All other things being equal, occupational situation explains the total amount of time that the couple devoted to domestic tasks. Regardless of whether unemployment affects the man or the woman, the total time devoted by the couple increases. The extent of the variation, however, differs significantly: the increase is much larger if the woman is unemployed (hypothesis 1 not verified). However, as for as the average participation of men is concerned (half that of women), the share of unemployed men in the overall time is the same as that of unemployed women (cf. last line of Table 3). In other words, unemployed men and women contribute to the

Table 4. Bivariate Tobit on the male and female domestic time (ln) in total, feminine, mixed and masculine tasks according to professional status.

Profes sional status of:	Time in domestic tasks (coef (T))									
	Total (model 1)		Total (model 2)		Feminine (model 1a)		Mixed (model 1b)		Masculine (model 1c)	
Man										
Unemploy- ment	**0.541** (6.54)	**−0.094** (−1.69)	**0.561** (6.68)	**−0.102** (−1.83)	**0.873** (3.79)	−0.151 (−2.22)	**0.779** (2.46)	−0.282 (−0.93)	1.584 (1.00)	−1.293 (−0.86)
Insecure job	−0.001 (−.01)	−0.085 (−1.61)	−0.060 (−0.76)	−0.086 (−1.64)	0.300 (1.32)	−0.027 (−0.41)	0.034 (0.11)	−0.067 (−0.22)	−0.680 (−0.43)	−0.446 (−0.32)
Secure job	0 (ref)	0 (ref)	0 (ref)	0 (ref)	0 (ref)	0 (ref)	0 (ref)	0 (ref)	0 (ref)	0 (ref)
Partial time	**0.216** (1.70)	−0.139 (−1.65)	**0.237** (1.86)	−0.138 (−1.63)	0.459 (1.30)	−0.168 (−1.60)	0.077 (0.16)	−0.117 (−0.25)	2.400 (1.00)	−1.051 (−0.45)
Inactivity	**0.478** (4.28)	−0.039 (−0.52)	**0.504** (4.48)	−0.043 (−0.57)	**1.226** (3.86)	−0.086 (−0.92)	**1.165** (2.72)	−0.079 (−0.19)	−2.281 (−1.05)	−1.991 (−1.02)
Woman										
Unemploy- ment	−0.048 (−0.64)	**0.483** (9.72)	−0.050 (−0.66)	**0.481** (9.65)	**−0.932** (−4.35)	**0.436** (7.01)	0.532 (1.83)	**1.202** (4.37)	1.818 (1.27)	**4.855** (3.80)
Insecure job	−0.048 (−0.66)	0.042 (0.87)	−0.109 (−1.51)	0.039 (0.81)	**−0.378** (−1.82)	0.012 (0.20)	−0.125 (−0.43)	0.295 (1.09)	−0.671 (−0.47)	1.955 (1.55)
Secure job	0 (ref)	0 (ref)	0 (ref)	0 (ref)	0 (ref)	0 (ref)	0 (ref)	0 (ref)	0 (ref)	0 (ref)
Partial time	−0.007 (−0.13)	**0.140** (4.01)	−0.005 (−0.10)	**0.138** (3.95)	−0.241 (−1.65)	**0.141** (3.26)	0.387 (1.91)	**0.460** (2.40)	−0.677 (−0.67)	0.449 (0.49)
Inactivity	−0.075 (−1.34)	**0.502** (13.55)	−0.082 (−1.46)	**0.508** (13.64)	**−1.242** (7.74)	**0.494** (10.65)	0.507 (2.33)	**0.822** (3.99)	1.315 (1.22)	**3.476** (3.58)
Correlation factor	0.093		0.092		−0.060		0.173		0.449	

Models 1, 1a 1b and 1c are controlled for age, social group of man, education of woman, income, number and age of children of the household, day of interview, domestic help, dwelling characteristics. Model 2 is controlled for male and female potential wages, man's age, household income, number and age of children of the household, day of interview, domestic help, dwelling characteristics.

Bold characters means significantly different from the reference (ref) modality at 10%.

Source: Survey « Emplois du temps 1998–1999 » (INSEE).

increase of couple's domestic time in proportion to their usual participation: the unequal distribution remains the same, it is neither reinforced nor reduced by the fact that one or the other is unemployed. Hypothesis 2 is thus verified. This result is consistent with ''gender norm'' approaches, more than with models which assume gender-symmetric answers after control for couple's characteristics.

If we analyze the type of tasks to which unemployed people devote more time, we observe differences between the sexes. Male unemployment increases male participation only in mixed tasks. The "masculine" tasks, which are probably too specialized in this case, are not affected[13]. In contrast, the occupational situation of the woman is always highly significant. When the wife is unemployed, the domestic activity of the couple is higher for these three types of tasks than when the wife is working full time. However, the total time spent by the couple does not reveal much in the sense that it only provides a partial answer to the question: are the members of the couple substitutable in production when one of them is unemployed? At this point, one can only say that men and women do not devote their additional time to the same tasks.

4.5. The domestic time of husband and wife: time transfers with specific targets

In order to confirm or refute the hypothesis of substitutability, we needed to compare the domestic inputs of partners of unemployed and employed persons (hypotheses 3a and 3b). The results of the bivariate tobit regressions on the individual amount of time devoted by the man and the woman are listed in Table 4. Unemployment increases the time devoted to domestic tasks, regardless of type of task, including those that are performed more seldom. Men increase their share of mixed and feminine tasks and women increase their share of masculine tasks. Does this transfer of time towards rarely performed domestic activities relieve the other partner of part of his or her domestic constraints?

In terms of total time, the impact of one partner's unemployment on the working partner's time (gray boxes of Table 4) does not show any substitutability effect, since women's participation in household tasks only barely decreases if the husband is unemployed. However, there are significant behavior differences if one differentiates by activity type. This result still supports the ''gender norms'' models. Indeed, we observe a symmetrical substitution effect for feminine tasks. The time devoted by men to feminine tasks decreases if their wives are unemployed, and the time devoted by women to feminine activities decreases if their husbands are unemployed.

With mixed tasks, we observe a rather unexpected effect. If the woman is unemployed, the man's participation in mixed domestic tasks increases. This may be the result of the working spouse's wish to make up for the unemployed spouse's social disadvantage by participating a little more in the tasks he is accustomed to do (budget, shopping and administrative tasks), that is, the tasks that are usually most equally distributed. Unemployment thus seems to lead to a new distribution of tasks between partners, with compensations so as to increase housework productivity. The

woman relieves the man of feminine tasks but leaves him the mixed tasks. The mixed tasks may also be more easily performed together and these joint activities may be more highly valued when one of the partners is unemployed.

On the one hand, we observe a substitution effect when unemployed men and women relieve their partner of part of the feminine tasks; however, on the other hand, we observe a specialization effect when the woman is unemployed. This asymmetrical effect may stem from the different status of feminine and mixed tasks. Feminine tasks are more often performed daily and at home, whereas mixed tasks can be performed elsewhere (shopping) and less regularly (accounts, administrative tasks). Thus, unemployed spouses tend to first relieve their partners of tasks performed at home. We do not observe any transfer of time in masculine tasks.

4.6. Quantity and diversity of domestic tasks

Lastly, does the fact that, relative to working persons, unemployed people devote more time to household tasks also mean that these tasks are more numerous and more diverse? Indeed, an unemployed person, having additional time at his or her disposal, may spend mechanically more of it on a given activity (shopping, for instance), but with the same results in terms of housework productivity.

We tested whether unemployed persons are ''less productive'' and if the substitutability hypothesis can be verified in terms of quantity of tasks performed. We developed two indicators for this purpose. The first indicator, pertaining to quantity of tasks, is based on the results of the activity booklet; this is the *Number of tasks performed in the last four weeks according to a classification of tasks based on eight types*. The other indicator, pertaining to diversity, concerns the *Number of different tasks performed on the days the booklet was filled in, according to a classification based on fifty types of activities*.

The drawback of these indicators, which pertain to a group of discrete answers, is that they attribute the same importance to all activities. The results are shown in Tables 5 and 6.

As it turns out, not only do unemployed people spend much more time performing domestic tasks, but they also carry out a greater number of tasks. If the woman is unemployed, then the total number of couple activities increases considerably (hypothesis 1 not verified); however, in proportion to their average participation, the increase in the number of tasks is similar for both unemployed men and women (hypothesis 2 is verified). Thus, it appears that if one partner is unemployed, the number of activities performed by the other partner decreases. Thus, the time substitution observed earlier is also confirmed in terms of number of activities. The increase in the amount of time spent goes along with an increase in the number of activities: thus, one cannot say that unemployed people are less productive (nor that they are more productive) than working people, but they both perform more tasks and devote more time to these tasks.

Table 5. Tobit on the number of activities in the last four weeks.

	Number of activities		
	Total (couple)	Man	Woman
Man			
Unemployment	**8.264** (1.76)	**21.003** (8.96)	**−13.402** (−3.80)
Insecure job	**7.841** (1.81)	3.385 (1.53)	1.675 (0.51)
Secure job	0 (Ref)	0 (ref)	0 (ref)
Part time	9.260 (1.28)	**14.847** (4.02)	−2.499 (−0.45)
Out of labor force	0.803 (0.12)	**15.361** (4.50)	**−16.247** (−3.23)
Woman			
Unemployment	**25.501** (6.21)	**−10.654** (−5.04)	**36.821** (11.88)
Insecure job	**6.530** (1.67)	**−5.220** (−2.65)	**14.486** (4.93)
Secure job	0 (ref)	0 (ref)	0 (ref)
Part time	**5.723** (1.98)	**−5.575** (−3.83)	**10.853** (4.98)
Out of labor force	**16.913** (5.60)	**−15.380** (−10.23)	**33.944** (15.03)
Hypothesis 1:	Not accepted	correlation factor	
Male and female unemployment	*No*		
have the same impact			
Hypothesis 2:	Accepted	−0.064	
Male and female unemployment	*Yes*		
have the same impact, in proportion			
to their average participation in society			

Controlled for age, social group of man, education of woman, income, number and age of children of the household, day of interview, domestic help, dwelling characteristics.

Bold characters mean significantly different from the reference (ref) modality at 10%.

Source: Survey « Emplois du temps 1998–1999 » (INSEE).

As far as diversity is concerned, both men and women perform a greater variety of tasks when they are unemployed, whereas their working partners reduce their range of tasks. Thus, unemployed people perform new tasks while their partners are relieved of others. Unemployment leads to a reorganization of domestic life, not only in terms of quantity (time devoted to domestic tasks), but also in terms of quality. Within this new form of organization, each person adapts his/her schedule for the purpose of maximizing domestic production.

If specialization between labor market and domestic sector is in this case warranted by economic constraints, the division of domestic labor between partners is not determined at random. It seems that at that level, partners specialize in certain tasks in order to maximize joint production.

5.   Conclusion

This article provided the opportunity to test the hypothesis of substitutability between partners, and to compare different explanations of domestic work division

Table 6. Poisson regression on the number of different daily domestic activities.

Professional situation	Number of different daily domestic activities	
	Man	Woman
Man		
Unemployed	**0.451** (9.41)	**−0.079** (2.15)
Insecure job	0.045 (0.85)	−0.054 (−1.57)
Secure job	0 (ref)	0 (ref)
Part time	**0.177** (2.31)	−0.083 (−1.42)
Inactivity	**0.429** (6.22)	0.024 (0.48)
Woman		
Unemployed	**−0.145** (−2.96)	**0.269** (8.87)
Insecure job	−0.071 (−1.48)	0.026 (0.81)
Secure job	0 (ref)	0 (ref)
Part time	−0.020 (−0.60)	**0.121** (5.35)
Inactivity	**−0.218** (−5.95)	**0.265** (11.65)

Controlled for age, social group of man, education of woman, income, number and age of children of the household, day of interview, domestic help, dwelling characteristics.

Bold characters mean significantly different from the reference (ref) modality at 10%.

Source: Survey « Emplois du temps 1998–1999 » (INSEE).

in a specific context, that of unemployment, whereby a person is forced by circumstances to perform additional domestic tasks. Despite the inertia due to specialization, we can advance that unemployment is a sufficiently serious change to imply adjustment between partners. According to empirical results, obtained thanks to different indicators for housework (time, quantity of tasks, and diversity of tasks), we observe that the employed partner does transfer to the unemployed partner some of the time s/he devotes to domestic tasks. The hypothesis of versatility cannot be rejected. In order to show more clearly how time is transferred between partners, one must make a distinction between different types of tasks. Indeed, the underlying mechanisms for these transfers are complex and seem to come rather from "gender norms" than from efficiency strategy.

If unemployed men and women do carry out a greater number and diversity of tasks, the participation of the working partner differs, depending on the type of task. The dominantly feminine tasks (performed mainly by women) are the most transferable: working partners transfer part of their share to the other partner if the latter loses his/her job. In contrast, unemployment does not reduce, and may even increase in the case of men, participation in mixed tasks. More than complete substitutability, couples facing unemployment create a new division of domestic tasks, both in terms of quantity (the unemployed partner performs more tasks and relieves his/her partner) and quality (the unemployed partner performs new tasks, the working partner concentrates on the tasks where s/he is more productive). Thus, when a

partner is unemployed, domestic tasks are organized according to a new, adjusted, specialization which is probably temporary. The resulting situation is not very clear-cut, since the partners seem to be non-specialized, each being able to perform the other's task if the latter is unemployed, but at the same time there is a new form of specialization based on the type of task performed by each partner. It might be useful in this case to give a wider breadth to the "gender norms" explanation of specialization within couples. As far as the uneven division of domestic tasks among spouses is concerned, inequality is reinforced if the woman is unemployed and reduced if the man is unemployed. Unemployed men and women both increase their participation in terms of time and number of tasks, but the increase is much sharper for unemployed women. Nonetheless, the increase in participation of unemployed men and women in domestic tasks retains the same proportions as those observed in the total population. Unemployment does not rebalance the classical domestic work division, but seems to be another expression of the strength of the habits and gender relations that exist in the private sphere.

Appendix: The bivariate tobit (G. S. Maddala, 1999)

The bivariate tobit model models the domestic time of both partners at the same time, taking into account possible interdependent factors.

y_h and y_f are respectively the observed domestic times of the man and the woman, $y_h{}^*$ and $y_f{}^*$ are the associated latent variables. y_h and y_f are likely to suffer from an "excessive-zeros" problem. We assume that $y_h{}^*$ and $y_f{}^*$ are determined by the following equations:

$$y_h* = \beta'_h x_h + \epsilon_h \quad \text{and} \quad y_f* = \beta'_f x_f + \epsilon_h$$

where ε_h and ε_f obey a normal two-dimensional law with $E[\varepsilon_h] = E[\varepsilon_f] = 0$ and $\text{Var}[\varepsilon_h] = \sigma_h{}^2$, $\text{Var}[\varepsilon_f] = \sigma_f{}^2$, $\text{Cov}[\varepsilon_h, \varepsilon_f] = \rho\,\sigma_f\,\sigma_h$, ρ is the correlation coefficient.

Our sample selection problem can be represented by distinguishing between four cases

Case 1: both parents have a domestic time exceeding 0

$$y_h = y_h^* \text{ and } y_f = y_f^* \text{ if } y_h^* > 0 \text{ and } y_f^* > 0.$$

Likelihood is the bivariate normal density function of the couple $(y_h - \beta_h x_h, y_f - \beta_f x_f)$ with mean $(0,0)$ and matrix of variance–covariance $\begin{pmatrix} \sigma_1^2 & \rho\sigma_1\sigma_2 \\ \rho\sigma_1\sigma_2 & \sigma_2^2 \end{pmatrix}$

Case 2: The man's domestic time is not equal to zero, the woman's domestic time is equal to 0. $y_h = y_h^*$ and $y_f = 0$ if $y_h^* > 0$ and $y_f^* \leq 0$

In this case, the likelihood corresponds to the product of the density with one dimension $f(y_h - \beta_h x_h)$ and the function of conditional distribution $F(y_f - \beta_f x_f)$. This is the cumulative distribution function of a normal average variable $\rho\,(\sigma_f/\sigma_h)(y_h - \beta_h x_h)$ with a standard deviation of $\sigma_f\sqrt{1 - \rho^2}$.

Case 3: If the woman's domestic time is not equal to zero, the man's domestic time is equal to zero.

$$y_f = y_f^* \text{ and } y_h = 0 \text{ if } y_f^* > 0 \text{ and } y_h^* < 0$$

This case is the mirror image of the previous one. The likelihood corresponds to the product of the density with one dimension $f(y_f - \beta_f x_f)$ and the function of conditional distribution $F(y_h - \text{bgr};_h x_h)$. This is the cumulative distribution function of a normal average variable $\rho\,(\sigma_h/\sigma_f)(y_f - \beta_f x_f)$ with a standard deviation of $\sigma_h\sqrt{1-\rho^2}$.

Case 4: the domestic time of both partners is equal to zero:

$$y_h = 0 \text{ and } y_f = 0 \text{ if } y_f^* \leq 0 \text{ and } y_h^* \leq 0$$

In this case, the likelihood corresponds to bivariate normal cumulative function $F(-\beta_h x_h/\sigma_h, -\beta_f x_f/\sigma_f)$

Then the total likelihood is

$$\pounds = \prod_1 f(y_h - \beta_h' x_h, y_f - \beta_f' x_f) + \prod_2 \int_{-\infty}^{-\beta_f' x_x} f(y_h - \beta_h' x_h, \varepsilon_f) d\varepsilon_f$$

$$+ \prod_3 \int_{-\infty}^{-\beta_h' x_h} f(\varepsilon_h, y_f - \beta_f' x_f) d\varepsilon_f + \prod_4 \int_{-\infty}^{-\beta_h' x_h} \int_{-\infty}^{-\beta_f' x_x} f(\varepsilon_h, \varepsilon_f) d\varepsilon_f d\varepsilon_h$$

where $\prod_i$ denotes product over all observations in case i, and f the density bivariate function of normal distribution.

Appendix : The French Time-Use survey

The *French Time-Use survey* (Enquête Emplois du temps) conducted by INSEE in 1998–1999 aimed to measure daily activities as precisely as possible. This survey was conducted in successive stages throughout the year, so as to avoid seasonal effects. On the day of the survey, the respondents write down their activities, indicating the time spent on each activity, according to 10-min time periods. Several activities may be performed at the same time; in that case, two activities are listed, one being considered as the main activity and the other as secondary. All the individuals of the household aged over 15 are surveyed. The survey covered:

– a household base of about eight,186 households, of which seven, 460 are complete (that is in which all the members filled in a booklet and an individual questionnaire);

Table of covariates (Frequency in % or mean).

Man's professional status		**Social class**	
Unemployment	6%	Worker	18%
Insecure job	6%	Medium level profession	22%
Secure job (reference)	84%	*Employee (reference)*	11%
Part time	2%	Manager	37%
Inactivity	2%	Farmer, tradesman	12%
Woman's professional status		**Man's age**	
Unemployment	8%	20–34 years old	22%
Insecure job	8%	35–44 years old *(reference)*	31%
Secure job	46%	45–55 years old	31%
Part time	17%	More than 55 years old	16%
Inactivity	21%	**Week day** (dummy)	73%
Household income (in francs)		**Dwelling**	
<700 (reference)	25%	Individual house	64%
7000–10000	6%	*Flat in a less than ten-flats building (ref)*	17%
10000–14000	14%	Flat in a ten-flat or more building	19%
14000–17500	18%	**Town size**	
17500–21000	14%	Villages	26%
21000–35000	18%	Little towns (less than 20000)	16%
>35000	5%	Paris and big towns	28%
Domestic help (dummy)	8%	*Medium towns (20,000–100,000.) (ref)*	18%
Number of children	1.5 (mean)	Suburbs of Paris	12%
Having a child under3 (dummy)	16%	**Number of rooms**	4.44 (mean)
Woman's education (diploma)		**Dwelling ownership** (dummy)	57
University 2nd level	10%	**Man's potential estimated wage**	10.33 (mean)
University 1st level	13%	(in thousand Francs)	
Secondary (reference)	19%	**Woman's potential estimated wage**	6.31 (mean)
Vocational	34%	(in thousand Francs)	
Primary, no diploma	24%	**Number of observations (couples)**	**3405**

– an individual base, which includes 20,370 individuals, among whom 16,442 are at least 15 years old;
– an activity base, containing one observation per line of filled-in booklets, representing 316,097 observations. 144 different types of activities are listed.

Our sample is made up exclusively of couples, pensioners and students excluded. We thus have 3405 couples, or 6810 individuals. The sample is weaker when we compare domestic times of partners because they had to both fill the questionnaire, and on the same day. Given that secondary activities are not frequently mentioned in the booklets, we focused our analysis exclusively on main activities. The sample is described in the Table of covariates.

Appendix : Is there a demand for tasks diversity?

In this idea, we interacted the feeling of unpleasantness with the frequency of several tasks. The question was:

Do you think this activity is

– a real chore
– a duty that does not bother you
– a pleasant activity

Several results could be pointed out.

The least repeated tasks are appreciated most (taking care of the garden, doing odd jobs). Except ironing, which is the most hated activity (for 90% of the sample answer, it is a chore or a duty). Men see current domestic tasks such as cooking, cleaning and washing dishes as less painful. But this result could come from an attrition bias since the few men that are doing these tasks (usually done mainly by women) might have chosen to do them, and then take more pleasure in them. However, it is also possible that these men find these tasks to be more pleasant because they seldom do them. So, we interacted the feeling of unpleasantness with the frequency of each task in the past four weeks.

The feeling of unpleasantness seems to be very slightly correlated to the number of tasks. However, a slight U-curve appears: when people perform a task very rarely or very often, they find it less painful. This test is not sufficient to advance that unpleasantness increases with the number of repeated tasks, and that there could be a demand for tasks diversity. Indeed, the question in three items does not allow much variance in answers and there is a selection bias since the question is only asked to people having done the task in the past four weeks.

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