Subsidizing Child Care :
A Policy Fitted to Single Mothers ?

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Abstract

Since the early 1990s, the French authorities have made the choice of developing household services by financially supporting home care utilization, in particular of child care services. The purpose of this study is to examine whether this policy is able to solve single mothers' difficulties in balancing professional activity and family life. The paper estimates on survey data the influence of the cost of child care on female labor market participation, with a distinction between single mothers and other mothers. The empirical results suggest that single mothers' child care price elasticity of participation is low (-0.13), especially by comparison with married women (-1.27). With half of this care cost subsidized, the predicted probability of employment would rise from 69 % to 87 % for married women but only from 81 % to 83 % for single mothers. Estimates also bring to light the major influence of diploma on married mothers participation decision, which may reflect the possibility to choose between employment and inactivity. On the opposite, labor force participation of single mothers seems to be little responsive and then possibly primarily determined by availability of low-cost child care solutions offering a great hours flexibility. The study concludes that specific difficulties of single mothers are not about to be eased by the current French policy of household services promotion.

Preliminary and incomplete.

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1   Introduction

Balancing professional activity and familial life is not easily achievable for a fringe of population. In France, the cost of child care centers depends on income, but they are far from being able to welcome as many children as necessary. This situation is the consequence of the French policy of household services development : since the 1990s, the authorities have promoted the development of individual solutions to child care by introducing various measures : subsidies (AFEAMA[1], AGED[2]), tax reductions and a choice of two methods for calculating contributions. The purpose is to make child care arrangements easier and besides to promote employment creation in household services. One may wonder whether these aids are likely to raise mothers labor participation by making child care arrangements more affordable. Single mothers' situation is studied in details, by comparison with married mothers' behaviour.

Several social and economic issues are at stake when we talk about women labor force participation. First, an increase in this rate would lower the gap between growth rate and its potential level. It would make the financing of social security easier by rising the number of contributors. A more social approach would insist on the role of female employment in the fight against child poverty, especially among single parent families. For this set of reasons, urging women on entering the workforce is on top of the agenda, in particular in the European Union. One of the Lisbon target is precisely to raise the female employment rate to 60 % before 2010.

The purpose of the paper is to evaluate the role of child care costs in single mothers behaviour on the labor market, in order to determine whether the French policy is likely to promote participation and then to lower poverty. It concludes that a simple decrease in child care costs is not an efficient solution to specific difficulties of single parents families. On the opposite, it would be an appropriate solution to raise married mothers' participation rate.

Section 2 presents a survey of literature. Then section 3 give details about household development policy in France since the 1990s. In section 4, the paper describes single mothers characteristics concerning situation on the labor market, child care arrangements and poverty. Section 5 develops a behavorial model quite similar to that of Kimmel (1998). It is estimated on two samples - 2975 married mothers and 269 single mothers. In a first step, child care costs and wages are constructed for non working mothers thanks to a Tobit II specification, then in a second step a labor force participation equation - in which the constructed wages and care prices are reported - is estimated.

2   Survey

Many papers about influence of child care availability and cost on single mothers participation come from the United States. The 1996 reform specifically generated many

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[1] Aide à la Famille pour l'Emploi d'une Assistante MAternelle, a subsidy to support use of childminder
[2] Allocation de Garde d'Enfants à Domicile, a subsidy to support use of child minder in parents' home

articles whose purpose was to evaluate some measures of the PRWORA (Personal Responsibility and Work Opportunity Reconciliation Act). This reform aimed at increasing financial incentives to be at work rather than living thanks to public assistance. In this context, single parent families are an important target and child care subsidies are especially at stake. The CCDF (Child Care and Development Fund) replaced four child care programs for low-income families by a unified and more generous plan. Several papers tried to estimate the effect of this legislative change on single mothers' labor supply. The paper follows this range of studies, trying to apply the methodology to the French policy of development of household services.

Blau and Hagy (1998) elaborate a model of choice of child care mode, number of care hours, hourly care price together with mothers' activity decision and number of hours worked. The paper is about married mothers and single mothers. Its originality lies firstly in the analysis in the same model of these discrete choices, and secondly in the fact that quality of child care considerations were taken into account. Household utility is a function of child care quality, leisure time, consumption of goods. It is maximized under budget and time constraints using a linear approximation. Child care quality is a function of number of paid care hours and unpaid care hours, mother's leisure time, paid care quality and unobserved characteristics of child care. In parallel, hourly price of care is modelled. A wage equation is used to construct a potential wage for non working mothers. They find that families are significatively responsive to the decrease in the care price, since they increase their demand of paid care (elasticity is -0.34) and labor supply (-0.20). Besides, quality and quantity are considered as substitutes by households.

Tekin (2002) develops a model which is close to that of Blau and Hagy (1998), but the study is only about single mothers. He evaluates for single mothers the impact of wage and child care price on employment decisions (full-time and part-time) and choice to use paid care. A behavioral model of activity choice and use of paid care is estimated, controlling endogeneity of receipt of child care subsidies. The main contributions of the paper are the modelling of simultaneous decisions and a distinction between full-time and part-time - which Blau and Hagy (1998) didn't made. The simultaneous decisions are modelled by the maximization of a utility function - depending on leisure time, child care quality - under time constraint. A wage equation and a child care price equation are estimated, with predicted values for women for whom these values are not observed. The care price elasticity of employment is -0.12, which is in the lower end of the range of estimated found in the litterature. Beside this result, Tekin (2002) finds that single mothers who are likely to work full-time are more sensitive to child care price that part-timers : a decrease of care prices fosters a rise in paid care use, mainly in relation to mothers who have an incentive to leave welfare and seek full-time employment, because for part-timers the gain would not be sufficient.

Still about single mothers, Tekin (2004) introduces a model more complicated than the previous one, with an equation of choice between four child care modes. The simultaneous decisions of participation and choice between these modes are treated by a choice model proposing four alternatives. The econometric model is a multinomial logit model with a random effects specification, which allows the existence of a correlation

between the error term related to the four alternatives. The selection bias is treated by the introduction of an equation of subsidy receipt including three instrumental variables : proportion of children for which the household receive care subsidies in the state, average amount of CCDF [3] subsidy by child in the state, a dummy variable indicating whether the state uses mass media as a consumer education strategy for child care subsidies. He finds that in the United States, in the post-1996 reform context, single mothers are highly responsive to subsidies. According to his results, the creation of CCDF increased the probability to choose an alternative in which the mother is employed by 15 percentage points. In particular, the probability of working and using purchased care increases by 33 percentage points while the probability of working and using relative care decreases by 16 percentage points.

Kimmel (1998) estimates a behavioral model with a utility function, a wage equation and a hourly care price equation to construct values when they are not observed. These constructed values take into account the selection bias. The labor participation probability of single mothers is simulated in case of a 50% reduction and a 100% reduction of child care price, and he finds that the rate would rise from 58% to 63% and 67% respectively.

Blau and Tekin (2005) model single mothers behaviour, with in a first step the determination of subsidy receipt and in a second step the effect of subsidies on outcomes such as employment and cash assistance. The econometric strategy consists in using in the first equation binary variables indicating the county of residence of families as instrumental variables. The estimation is based upon the following identifying assumption : the only source of difference in outcomes between counties is imputable to differences in the attribution of subsidies. The result is that the CCDF subsidies which were handed out within the context of PRWORA[4] fostered a 33 percentage points increase in single mothers' participation rate, whereas using the ordinary least squares method - that is to say without considering selection effect in attribution of subsidies - they find only a 13 percentage points increase.

In the same way, Berger and Black (1992) estimate the impact of a child care subsidy on single mothers' employment rate. The main contribution of the paper lies in the analysis of child care quality, of which several indicators are proposed - distance to home, degree of parents' satisfaction. They take account of selection effect in the attribution of the treatment - subsidy receipt - by using people of the waiting list as control group. According to the results, the effect of the program is a 12 percentage points increase in single mothers' employment rate.

Some other studies shed light on complementary themes, evaluating by other manners elasticity of single mothers' labor participation. For example, Gelbach (2002) focus on entry in free maternal public school, which may be put in the category of an increase in direct provision of public offer of child care service. With the purpose of evaluating the impact of a child's admission at public school, he makes the most of the role of date of birth in the admission process : the birth trim is used as a instrumental variable,

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[3] Child Care Development Fund, see section 1
[4] see section 1

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because its influence on maternal labor supply is only conveyed by the admission to public school. This effect turns out to be significative, with a 6 to 24 percentage points increase depending on the subpopulation we consider.

3 The household services development policy in France

Public policies in the field of household services first intended to tackle specific problems of households, like dependency and insufficiency of child care solutions. It first took the shape of exemptions of the payment of social security contributions for dependent elderly people and employers of a child minder (see table 1). Then measures were extended to a wider range of needs. The French authorities indeed intended to make the most of the existence of unsatisfied social needs to reach the goal of creating jobs. One may consider that the turning point occurred in 1991, with the creation of a tax reduction for people employing household services workers.

Balancing these two objectives is not easily achievable. There indeed may be a trade-off between job creation and satisfaction of social needs for everybody, and especially those who experience difficulties to satisfy their need for assistance for child care or dependency. The objective of job creation incites public authorities to foster a household demand which is supposed to be latent, by lowering the net price to the reservation price of each household. The difference will be all the more costly to compensate that household resources are low. The job creation policy will consequently be all the more efficient that it is targeted on high-income households. In this respect, the situation of single parent families is especially representative : the resources of the household are especially low whereas an affordable child care solution is critical to allow the parent to be employed.

The most obvious expression of this trade-off is the tax reductions which have been implemented since 1991. They indeed only benefit to the households whose income is sufficient to pay the French income tax, which means that they belong to the top half of income distribution (in France, about every 2 fiscal households does not earn enough to pay the income tax). The creation of a tax credit for child care services in 2005 and the replacement of the tax reduction introduced in 1991 by a tax credit since the declaration of 2007 incomes (see table 1 and 2) are significant steps toward a more equitable way of developing household services.

Table 1: The policy of development of household services in France since the 1980s

Measure	Date of creation	Scope	Contents
Exemption of social security contribution	1987	Home employment (elderly and disabled people)	Exemption of 50 % of social security contribution
AGED (in home child care allowance)	1987	In parents' home	Exemption of 50 % of social security contribution
Tax reduction	1991	Household services jobs	Tax reduction of 50 % of the sums paid out
AFEAMA (allowance for the employment of a childminder)	1991	In minder's home	Monthly subsidy (71.6 euros, 86.4 or 109.3) depending on living standard and number of children
Authorized organi--zations for services to individuals	1991	Child care and assistance to the elderly and the handicapped	Creation of a specific notion in the purpose of expending the offer of services by the network of nonprofit associations
Chèque Emploi services	1993	Household services	Alleviate administrative formalities, in particular the calculation of the amount of social security contributions
Titre Emploi services	1996	Household services	Works council or firms can contribute to the payment of the household workers that their workers employ
Extension of the notion of authorized organisations to firms	1996	Household services	Private firms are authorized to have the agreement, which allows their customers to benefit from the tax reduction
Value added tax reduction	1999	Household services	Reduced rate on every activity of household services (5.5 % instead of 29.6 %)
APA (Autonomy allowance)	2002	Dependent people over 60	Monthly subsidy whose amount depend upon resources and need of support (between 500 and 1200 euros)
PAJE-CMG (allowance forchild care)	2004	Home care or childminder	Exemption of 50 % (100 %) of social security contribution for home care (childminder) 85 % of net wage is reimbursed
Tax credit	2005	Child care center or childminder	50 % of the sums paid out, subject to a ceiling (2300 euros in 2006)
Tax credit	2007	Home employment and every child care modes	50 % of the sums paid out, subject to a ceiling (credit or reduction of 6000 euros). Only for active employers

3.1 Child care subsidies in France

Various measures have been implemented in France for the support of families with children. On the one hand, some benefits are allowed to families, possibly without financial conditions, for child support. Every family with at least two children is eligible to an allowance whose amount is dependent on the number and age of children. Some subsidies are only allowed to people whose resources are considered as too low to offer satisfactory conditions to bring up children. For example, the allowance for single parent (the so-called *API, Allocation de Parent Isolé*) is allowed to parents who raise alone a child under three. It is a differential allowance which rises the income up to a certain level. The second category of familial allowance is about child care. A new subsidy system was implemented in January 2004, with the creation the so-called PAJE, which is progressively substituted to a set a allowances (a birth allowance, a subsidy for the employment of chilminders in his home or at the parents' home, and a benefit for women who stop working for taking care of their children) and extends the benefits of the tax reduction to employers of child minder when the care is not at home.

Table 2: Child care benefits in France in 2002 and since 2002

Subsidy	Child care mode	Amount	Requirements
AGED (1987)	In parents' home	Exemption of 50 % of social security contribution	The child is under 6 and every adult of the household is active
AFEAMA (1991)	In minder's home	Monthly subsidy (71.6 euros, 86.4 or 109.3) depending on living standard and number of children	The child is under 6
Tax reduction (1991)	Home employment	50 % of the sums paid out, subject to a ceiling reduction of 6000 euros)	
PAJE-CMG (2004)	Home care or childminder	Exemption of 50 % (100 %) of social security contribution for home care (childminder) ; 85 % of net wage is reimbursed subject to a ceiling depending on age of child and living standard of the household	The child is under 6
Tax credit (2005)	Child care center or childminder	50 % of the sums paid out, subject to a ceiling (2300 euros in 2006)	All parents of children under 7
Tax credit (2007)	Home employment and every child modes	50 % of the sums paid out, subject to a ceiling (credit or reduction of 6000 euros)	Since the 2007 income tax declaration (early 2008). Active employers.

4 Data description

4.1 The Child Care Arrangement Survey

The data we use were collected in 2002 by the statistic office of the French Health Ministry (Direction de la Recherche, des Etudes, de l'Evaluation et des Statistiques). The purpose of this survey about child care arrangement was to describe the range of child care modes that parents use, to understand their degree of satisfaction and the constraints which they are faced with. A sample of 3,343 households with children were questioned. This sample was selected in the Housing Survey of INSEE (Institut National de la Statistique et des Etudes Economiques). A post-stratification was imposed to the survey, that is to say that the dispersion of several variables was constrained to be similar to that of an another source. The dispersion of familial structure, mother participation, age of the head of household, sociooccupational category, were that of the Labor Force Survey of INSEE.

269 households among questioned ones are constituted by a single mother and her children. The sample is little, but it is generally the case when we study single parent families. 2,975 married mothers (or living in unmarried cohabitation) constitute the second sample.

4.2 Descriptive statistics

The survey gives detailed information on child care arrangements. A calendar shows 150,139 lines, one for each household child care at a moment. For the study, we aggregate this much detailed information to keep a distinction between different types of paid child care arrangements : child minder, child care center, home care, unpaid child care. Child care arrangements like school or daycare after school, are not taken into account. We indeed focus on care modes which are in the category of household services and which are mainly for children under 3. The care costs of women at work only are considered and for the other mothers this cost is by definition zero, since we are only interested by the constrained costs. We define the main child care mode of a household as the arrangement with the most important volume of hours in the month.

4.2.1 Work and use of child care are very differentiated between married and single mothers

The threshold of relative poverty is set by Eurostat at 60 % of the median income. We take as a reference the 2002 threshold (752€ by month[5]). According to this benchmark, 54 % of the single mothers of our sample are considered as poor, whereas the rate is 12 % for the whole population in 2002, and 16 % for married women of the sample.

Table 3 brings several facts to light, in particular the low rate of single mothers in parental leave (4 %) by comparison with married mothers (16 %). As a consequence, the

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[5]See the INSEE publication "France Portrait social 2005-2006", Thematic card 15 - Standard of living and poverty

participation rate of single mothers (82 %) is far higher than that of married mothers (67 %)).

It shows too that single mothers use unpaid child care (including by herselves) far more frequently than married mothers (71 % and 62 % respectively), whereas they proportionally more often have a job (65 % of single mothers and 59 % of married mothers are at work).

Table 3: Labor force participation and child care arrangements of married mothers and single mothers

	Single mothers	Married mothers
Poverty rate	54 %	16 %
Number of children under 18	1.9	2.0
Labor market participation	82 %	67 %
Work	65 %	59 %
Training	2 %	1 %
Unemployment	15 %	7 %
Inactivity	18 %	33 %
Parental leave	4 %	16 %
Other situations of inactivity	14 %	17 %
Working households		
Mother monthly wage	1 240	1 206
Mother monthly hours worked	131	129
Mother hourly wage	9,8	9,6
Child care arrangements		
Child minder	15 %	24 %
Child care center	10 %	11 %
Home care	4 %	3 %
No purchased child care	71 %	62 %

4.2.2 Solutions for child care strongly depend on families' income

Table 4 brings to light the major role of employment concerning poverty : 42 % of poor single mothers but 92 % of non poor ones have a job. In the same way, the use of child care seems to be very differentiated : 83 % of poor single mothers use no paid child care mode. These results confirm the intuition according to which low income, no use of paid child care and low probability of employment are concentrated on a fringe of the population.

Every two one-parent families of the sample resort to a child minder in his home, home care is only used by 15 %, the other ones using child minder (see table 5). The net cost is 1.27 euros par hour, while child care centers only costs 0.80 per hour. Home care is far more expensive (4.00 euros per hour). The proportion of poor one-parent families who use paid child care is only 16 % (table 6), and among them, the mean net hourly price is 0.90 euros. Only 12 % of skilled and unskilled workers use paid care, whereas

Table 4: Labor force participation and child care arrangements of poor and non-poor single mothers

	Non poor	Poor
Proportion of the sample	46 %	54 %
Number of children under 18	1.7	2.0
Participation	96 %	70 %
Work	92 %	42 %
Training	0 %	3 %
Unemployment	4 %	25 %
Inactivity	4 %	30 %
Parental leave	2 %	5 %
Other situations of inactivity	2 %	25 %
Working households		
Mother monthly wage	1,607	526
Mother monthly amount of hours worked	138	116
Mother hourly wage	11.83	4.35
Child care arrangements		
Child minder	26 %	5 %
Child care center	8 %	12 %
Home care	10 %	0 %
No purchased child care	56 %	83 %

35 % of office clerks and service workers, 45 % of technicians, and 71 % of executives rely on paid care (table 7).

Table 6 and 7 suggest the existence of a correlation between child care costs, number of hours using a paid care mode, and income of the single mother. This phenomenon may be firstly explained by the fact that the cost of some child care modes - mainly public care centers - are directly linked to parents' income. But the main explanation certainly lies in the fact that a household who works and use paid child care arrangements for a long period of time each week is likely to be a well-off household using expensive child care modes. Their income indeed allow them to avoid asking relatives for help, but also to use a higher level of quality, especially concerning hours flexibility.

Table 5: Hourly cost of child care modes for single mothers

	Proportion of families	Gross cost	Net cost
Child minder	50 %	1.82	1.27
Child care center	35 %	0.96	0.80
Home care	15 %	4.59	4.00

Table 6: Child care costs of single mothers

	Non poor	Poor
Use of paid care	44 %	16 %
Cost and number of hours of paid care		
Gross hourly cost	2.2	1.2
Reduction due to AFEAMA by hour	0.3	0.3
Reduction due to l'AGED by hour	0.02	0.02
Tax reduction by hour	0.2	-
Net hourly cost	1.8	0.9
Number of hours by month	132.8	111.9
Amount of subsidies (among recipients)		
AFEAMA by hour	0.94	1.12
AGED by hour	0.51	0.50
Tax reduction by hour	0.76	-
Proportion of recipients among people using paid care		
AFEAMA	30 %	11 %
AGED	4 %	2 %
Tax reduction	28 %	-

Table 7: Labor market participation and child care arrangements of working single mothers

	Executives and professionals	Technicians and associate professionals	Office clerks and service workers	Skilled and unskilled workers
Number of women	17	50	87	21
Proportion	10 %	28 %	50 %	12 %
Child care modes				
No paid care	29 %	55 %	65 %	88 %
Child minder	24 %	29 %	18 %	8 %
Child care center	18 %	8 %	16 %	0 %
Home care	29 %	8 %	1 %	4 %
Whole sample				
Gross hourly cost	2.10	0.93	0.55	0.48
AFEAMA by hour	0.10	0.16	0.10	0.46
AGED by hour	0.04	0.01	0.01	-
Tax reduction by hour	0.38	0.03	0.04	-
Net hourly cost	1.55	0.74	0.42	0.43
Number of hours by month	78	61	51	20
People using a paid child care				
Gross hourly cost	2.93	2.01	1.51	(*)
AFEAMA by hour	0.14	0.34	0.27	-
AGED by hour	0.06	0.01	0.02	-
Tax reduction by hour	0.53	0.06	0.11	-
Net hourly cost	2.20	1.60	1.15	-
Number of hours by month	111	133	138	-

(*)The sample of workers using paid care is to week to get reliable figures

5 Model and estimations

5.1 Theoretical model

The theoretical model of Connelly (1992) is a behavioral model which is used in other studies, as for example Kimmel (1998), Ribar (1992) and Schroeder and Snowe (1994). The maximization of a utility function yields labor force participation and use of child care behaviour. The utility is a function of leisure time, goods consumption and child care quality. This function is maximized under several requirements : time constraint, budget constraint and a production function for child care services.

$$\begin{cases} U = U(L, X, Q) & \textit{Utility function} \\ Q = Q(t_m, t_q, N, A) & \textit{Production function of quality of child care} \\ t_w.W + V = X + c_q.t_q & \textit{Budget constraint} \\ t_w + t_m + t_L = 1 & \textit{Parental time constraint} \\ t_Q + t_m \leq 1 & \textit{Children's time constraint} \end{cases}$$

where L is leisure time, X is consumption of a composite market good, Q is the quality of the main child care mode, t_m is the amount of time the mother spend with her child. Children may be cared by other non-paid care modes, that is why $t_Q + t_m$ does not necessarily equals 1. t_q is the amount of time spent in child care, t_L the amount of time spent at work, W the wage, c_q the child care cost. N is the number of children in the family and A is the ages of children.

The care cost we consider is that of working women, while for all women who don't have a job we set this cost at zero. The purpose of the study is indeed to evaluate the budget constraint which mothers have to cope with when they work. So the fact that some mothers are able to use unpaid child care modes is interesting for us. On the opposite, the use of paid care by non-working mothers is not taken into account, for it does not reflect the cost they would have to pay if they were at work.

One of the first order conditions is then :

$$U_L/U_X = W = U_q/U_X.(Q_1 - Q_2.q*) + P_q{}^*$$

where $P_q{}^*$ is the price of child care at the optimally chosen level of quality Q. The third expression is the net benefit of the time spent in paid child care, it is also the sum of the net benefit (in terms of quality) of mother care versus non-parental care ($U_q/U_X.(Q_1 - Q_2.q*)$) and the money savings in relation to an hour of mother care ($P_q{}^*$).

5.2 Estimation strategy

Our data allow us to calculate three main indicators of the way single parent families balance professional activity and familial life : hourly cost of child care modes, monthly hours of care and employment status of mothers. Estimating the effect of availability of child care modes on women labor force participation raises a problem of simultaneity

and endogeneity. Indeed, firstly, participation and child care use are dependent decisions. Secondly, the plausible correlation between hourly cost, number of paid care and standard of living, let us think that the hourly cost variable is likely to be endogenous to the number of paid child care hours and to the participation decision. To estimate the female labor supply elasticity to availability of child care modes, we use an econometric strategy which takes into account this endogeneity.

In parallel, a second estimation problem is raised by the fact that some women don't work and some don't use child care. The distribution of wages and hourly care costs is partially unobservable. This censorship will be treated by constructing predicted values when values are missing. Lastly, the construction of wages is all the more complex as our survey data don't give a wage for all the women of the sample who have a job. The correction for sample selection will then be based upon the selection of individuals who have a wage (and not those who have a job).

5.3   Econometric model

We estimate the effect of hourly care cost on labor supply of single mothers. The model must be converted into a reduced form to be estimated. We estimate a probit - quite similar to that of Connelly (1992) or Ribar (1992) - whose regressors are in particular the predicted values of wage and hourly cost of child care. In a first step, we have to construct a wage for unemployed women, and a cost to those who don't use a paid child care service. For this purpose we implement a type II Tobit model, for it is fitted to the specifications in which a variable (wage in our case) is just observable when another variable takes some values (here, when mothers have a job and a wage declared in the survey). The equations with sample selection are estimated with the technique of maximum likelihood. The construction of wages and child care costs are implemented with SAS IML. The participation equation is estimated thanks to SAS 9.1 (PROC QLIM).

5.3.1   Construction of predicted value of wages and child care costs

In a first step, we construct child care cost for women who don't work, which implies to take into account the selection effect. The financial burden of child care is indeed observed by definition only for women at work. Given they are also probably the one whose potential wage is the highest, we have to take into account the fact that they are not representative of the whole sample. We must then correct for sample selection, as well for wages as for care costs.

In a second step, the construction of wages raises more econometric difficulties, in relation to data characteristics. We are indeed only able to calculate the hourly wage of 126 women whereas in the sample 176 mothers have a job, because for 50 working mothers we don't have at our disposal neither hours worked nor monthly wages. It is then necessary to treat this double-selection problem. The estimation of the wage equation with 2 selection equations raised important problems, so that we eventually chose to use a unique selection equation which synthesizes the double selection : the

dependent variable is a dummy indicating whether the mother has both a work and a wage declared in the survey or not. The technique requires that the selection equations integrate at least a variable which is not in the list of regressors of the cost and the wage equations. They are exclusion variables, which allow to catch the selection effect and to purge the predicted cost and wage of the selection effect. Like instrumental variables, they should have an impact on wages (or child care costs) whose effect is only conveyed by the selection variable (the employment status for care costs, and the dummy indicating whether the mother has both a work and a wage declared in the survey for wages). Non-labor income, departmental rate of unemployment, age structure and number of children may have an impact on hourly wages and child care costs which is only conveyed by the fact to have a job. Empirically, the rate of unemployment in the department and the number and age of children are efficient for the wage equation, while the departement rate of unemployment and the mother's age play well for the child care equation. Variables in relation to relatives' proximity may appear as valid instruments. But when we constructed data, we only considered the child care of working people, that's why the relatives' proximity has an influence on care cost, but this impact does not only passes through the fact to be at work : a mother whose income is high might use a care by a relative although she could use a paid care, and in such a case the relatives' proximity has an influence on cost but not on employment status.

5.3.2 Model specification

The econometric model may be written as follow :

$$
\begin{cases}
E^* = X_1\epsilon_1 + u_1 & \textit{Latent variable which determines the fact to have a job} \\
 & \textit{and a wage declared in the survey} \\
E = 1_{\{E^*>0\}} & \textit{Equation of the corresponding binary variable} \\
W = (Y_1\gamma_1 + v_1) * 1_{\{E^*>=0\}} & \textit{Hourly wage equation} \\
G^* = X_2\epsilon_2 + u_2 & \textit{Latent variable which determines the fact to have a job} \\
G = 1_{\{G^*>0\}} & \textit{Employment equation} \\
c = (Y_2\gamma_2 + v_2) * 1_{\{G^*>=0\}} & \textit{Hourly price of care equation} \\
P^* = W - c - ln\overline{w} + v & \textit{Latent variable which determines labor force participation} \\
P = 1_{\{P^*>0\}} & \textit{Labor force participation equation}
\end{cases}
$$

The reduced form is :

$$
\begin{cases}
E = \Phi(X_1\alpha_1) & \textit{Equation which determines the fact to have a job} \\
& \textit{and a wage declared in the survey} \\
W = [Y_1\gamma_1 + v_1]1_{\{E=1\}} & \textit{Hourly wage equation} \\
G = \Phi(X_2\alpha_2) & \textit{Employment equation} \\
c = [Y_2\gamma_2 + v_2]1_{\{G=1\}} & \textit{Hourly price of care equation} \\
P = \Phi(Y\alpha + \psi * \hat{c} + \beta * ln\hat{w}) & \textit{Labor force participation equation}
\end{cases}
$$

with

$$
\begin{pmatrix} u_1 \\ u_2 \end{pmatrix} \sim \mathcal{N}\left(\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} \sigma_{u_1} & \rho_{u_1 2} \\ \rho_{u_1 2} & \sigma_{u_2} \end{pmatrix} \right)
$$

$$
\begin{pmatrix} v_1 \\ v_2 \end{pmatrix} \sim \mathcal{N}\left(\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} \sigma_{v_1} & \rho_{v_1 2} \\ \rho_{v_1 2} & \sigma_{v_2} \end{pmatrix} \right)
$$

$$
v \sim \mathcal{N}(0, \sigma_u)
$$

The specification of (u_1, u_2) takes into account the possibility of a correlation between unobserved determinants of having a job, on the one hand, and on the other hand having a job and a wage declared in the survey (which is obviously different from zero because the second induces the first). And the specification of (v_1, v_2) implies the eventuality of a correlation between unobserved determinants of wage and child care cost (which is probably non null because they are both linked to the standard of living) .

5.4 Results

5.4.1 The effect of various explicative variables

We estimate five equations for the 269 single mothers for whom we have information in the sample, on the one hand, and on the other hand for 2975 married mothers. Results are presented in table 8 to 17. Table 12 and 14 are useful to detect the influence of number of children on employment status. The estimated coefficients of these explicative variables are significantly negative in most cases, and all the more so as children are young. The presence of children then implies a lower probability of employment.

On the opposite, and as expected, diploma is a factor of greater probability of employment. The estimated coefficients of the three lowest levels of diploma in table 14 (-0.73, -0.46, -0.22) and of the highest level (+ 1.39) in table 12 show that diploma acts strongly on the participation decision of married mothers and single mothers. Wage equations let effects appear which are conform to the theory : the estimated coefficients of age and diploma are significantly positive (see table 9 and 11).

Table 16 and 17 give results of labor force participation equation, which allows us to determine the effect of child care cost on single mothers and married mothers. First, we notice that the number of children exerts a negative influence on female participation[6].

---

[6]Parental leave is not considered as activity by the International Labor Office

In particular, the presence of children under 3 has a significantly negative effect on single women's participation, whereas its effect is not significant on married women.

Another result is that diploma seems to have a significant impact on married mothers activity, but not on single mothers participation. It could be interpreted as follows : single mothers determine their participation behaviour according to the constraint they face (number of children, budget constraint), whereas married women are under a weaker restraint and they are consequently more likely to have the choice to work or not. Surprisingly, the coefficient of hourly wage is significantly negative (-3.06) for married mothers. The same regression without diploma variables - we try this regression to evaluate the coefficient when the effect of diploma is not conveyed by these variables -, gives a less negative but still significant coefficient (-1.34). This negative effect of hourly wage may capture the fact that women may choose not to work if their husband has a high wage, if we take into account the positive correlation which exists between the members of a couple's wages.

Introducing dummies of urban area size allows us to see that living in Paris promotes employment among married women, but the effect is contrary on single mothers. This result may be explained if we consider that it is less probable to live near relatives in Paris than in a rural commune. In parallel, urban life is likely to go hand in hand with a stronger preference for employment among married mothers.

5.4.2 The effect of child care costs on the labor force participation of mothers

We now consider the effect of child care costs as they appear in labor force participation equations. The estimated coefficients are -0.36 for single mothers and -2.48 for married women. In both cases coefficients are significant. Child care price elasticity of participation is calculated thanks to these coefficients. For married women we find -1.27, and -0.13 for single mothers (see table 18). The mean marginal effect is -0.45 for married mothers while it is only -0.06 for single ones. The participation probability for direct child care subsidies of 50 % would rise from 69 % to 86 % for married women but only from 81 % à 83 % for single mothers (table 19). The rate would rise by 3.7 points for poor single mothers and by 1.6 points for non poor ones.

Several conclusions may be drawn from these results. At first, child care price exerts a greater effect on poor single mothers than on non-poor single mothers. But this effect is largely due to the fact that a single mother whose income is beyond poverty threshold is in most cases at work : 92 % of non poor single mothers are at work, so the effect on this population just can't be large. But the main result is that married mothers' behaviour is far more elastic to care price than that of single mothers. While a cost divided by two would rise the participation rate of married women by 17.7 points, for single mothers this rate would only rise by 2.6 points. The child care price is not a major criteria for the participation decision of single mothers.

This result is conform to Kimmel (1998), whose estimates of this elasticity is -0.22 for single mothers and -0.92 for married mothers. Most articles only estimate a married women's elasticity, and among these studies Connelly (1992) finds -0.20 and Ribar (1992)

-0.74. The large magnitude of differences between estimates is largely imputable to the various choices of the measure of child care prices.

One may notice that the small size of our sample of single mothers (269 people) is a limit to the accuracy of estimates, especially because the variability of data is not as large as we could hope.Nevertheless, the survey was designed for the purpose of studying child care and dispersion of mother participation and familial structure is that of the Labor force survey, whose sample is far greater. Besides this, new data will be collected in November 2007 and will be available mid 2008. It will then be possible to estimate the model on a sample twice as large as this one. It is an extension of the paper we already planned to achieve.

6 Conclusion

These results suggest that child care costs are not the major barrier to single mothers' employment. Whereas diploma plays an important role in married mothers' decision of labor market participation, number of children is the only significative variable for single mothers. This may be interpreted as a consequence of the preponderance of organizational constraints. The first criterion of single mothers' employment decision could be the availibility of flexible care modes - especially concerning opening hours. In this context, a moderate price would be necessary but not sufficient. Child care cost is just a marginal element, when the situation is segmented between those whose marital situation allows to balance family life and professional activity and those who face important organizational problems. The participation decision of married mothers is apparently based upon different criteria, and they benefit from a greater freedom of choice. Personal preferences take a greater importance, which could explain a role of diploma which is larger than that of single mothers. Increasing care subsidies does not eventually seem to be a solution to increase single mothers' rate of employment.

The policy of household services development, which involves a growing individual use of child care services, is the subject of much attention from French authorities. The study let us think that it is not able to solve specific difficulties of single mothers because the financial incitation to be at work is not efficient, and then their large poverty rate is not likely to decrease by this way. Whereas subsidies seem to be an efficient way to promote participation of married mothers, the paper suggests that to make single mothers' access to employment easier, subsidies are quite inefficient. A voluntarist policy of public child centers development, with hour flexibility, would probably be more fitted if the French authorities decided to give priority to the improvement of single parent families' situation. This hypothesis is yet to be tested on French data.

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A   Estimations results

A.1   First-step estimations - Construction of wages and child care costs

Table 8: Equation indicating the fact to have a job and a hourly wage declared in the survey - Single mothers

Paramètres	Estimations	Standard errors	Significativity
Constant	-0.28	0.74	
Number of 1-3 year old children	-0.87	0.21	*
Number of 3-11 year old children	-0.38	0.12	*
Number of children over 11	-0.15	0.15	
Diploma dummy (*)			
1 - elementary diploma	-0.65	0.28	*
2 - professional diploma (CAP, BEP)	-0.15	0.27	
3 - graduate or diploma taken after 2 years at University	0.25	0.27	
Age (/100)	3.55	1.68	*
Rate of unemployment of the department	-0.01	0.04	

(*) *Levels 1, 2 and 3 in a scale of 4 levels.*
In France, Baccalauréat is the diploma which end up high school and allows to access higher education
(in particular university). Baccauréat + 3 corresponds to a licence, Baccauréat + 5 is a master
In our classification, level 3 is Baccalauréat or Baccalauréat + 2 years

Table 9: Wage equation - Single mothers

Parameters	Estimations	Standard errors	Significativity
Constant	1.11	0.52	*
Diploma dummy			
1 - under elementary diploma	-0.82	0.20	*
2 - professional diploma (CAP, BEP)	-0.61	0.17	*
3 - graduate or diploma taken after 2 years at University	-0.19	0.16	
Age (/100)	3.14	1.25	*

Table 10: Equation of determination of the fact to have a job and a hourly wage declared in the survey - Married mothers

Parameters	Estimations	Standard errors	Significativity
Constant	-0.18	0.23	
Number of 1-3 year old children	-0.39	0.06	*
Number of 3-11 year old children	-0.18	0.04	*
Number of children over 11	-0.24	0.05	*
Diploma dummy			
1 - under elementary diploma	-0.36	0.08	*
2 - professional diploma (CAP, BEP)	0.38	0.07	*
3 - graduate or diploma taken after 2 years at University	-0.04	0.06	
Age (/100)	2.29	0.53	*
Rate of unemployment of the department	-0.02	0.01	*

Table 11: Wage equation - Married mothers

Parameters	Estimations	Standard errors	Significativity
Constant	2.57	0.21	*
Diploma dummy			
1 - under elementary diploma	-0.63	0.09	*
2 - professional diploma (CAP, BEP)	-0.47	0.07	*
3 - graduate or diploma taken after 2 years at University	-0.36	0.06	*
Age (/100)	1.58	0.47	*

Table 12: Employment equation - Single mothers

Parameters	Estimations	Standard errors	Significativity
Constant	-0.10	0.65	
Number of 1-11 year old children	-0.48	0.11	*
Diploma dummy			
4 - over licence	1.39	0.44	*
Non-labor income (log)	0.01	0.04	
Rate of unemployment of the departement	-0.06	0.04	
Age (/100)	5.06	1.54	*

Table 13: Child care cost equation - Single mothers

Parameters	Estimations	Standard errors	Significativity
Constant	1.57	0.39	*
Number of 1-3 year old children	0.30	0.44	
Number of 3-11 year old children	0.07	0.28	
Diploma dummy			
4 - over licence	-0.79	0.47	

Table 14: Wage equation - Married mothers

Parameters	Estimations	Standard errors	Significativity
Constant	-2.75	0.73	*
Number of 1-11 year old children	-0.56	0.04	*
Diploma dummy			
1 - under elementary diploma	-0.73	0.08	*
2 - professional diploma (CAP, BEP)	-0.46	0.07	*
3 - graduate or diploma taken after 2 years at University	-0.22	0.07	*
Non-labor income (log)	0.01	0.01	
Rate of unemployment of the department	-0.04	0.01	*
Age (/100)	25.02	4.21	*
Age squared (/10 000)	-32.83	6.04	*

Table 15: Child care cost equation - Married mothers

Parameters	Estimations	Standard errors	Significativity
Constant	0.46	0.10	*
Number of 1-3 year old children	0.52	0.06	*
Diploma dummy			
4 - over licence	-0.05	0.08	
Relatives' proximity dummy	0.06	0.07	

A.2 Second-step estimations : Labor force participation equations

Table 16: Labor force participation equation - Impact of care cost on participation - Single mothers

Parameters	Estimations	Standard errors	Significativity
Constant	-14.67	3.93	*
Hourly wage (observed, otherwise constructed)	0.22	0.36	
Hourly child care cost (observed, otherwise constructed)	-0.36	0.13	*
Number of 1-3 year old children	-1.15	0.25	*
Number of 3-11 year old children	-0.46	0.15	*
Number of children over 11	-0.68	0.18	*
Rate of unemployment in the department	0.04	0.05	
Dummy diploma			
2 - professional diploma (CAP, BEP)	0.25	0.28	
3 - graduate or diploma taken after 2 years	0.27	0.40	
at University			
4 - over licence	0.47	0.57	
Non-labor income (log)	1.13	0.30	*
Age (/100)	31.50	18.14	
Age squared (/10 000)	45.53	26.98	
Size of the urban area			
Rural commune	0.91	0.45	*
Under 10 000 inhabitants urban unit	0.32	0.44	
10 000-50 000 inhabitants urban unit	0.33	0.41	
50 000-2 000 000 inhabitants urban unit	0.32	0.32	

Table 17: Labor force participation equation - Impact of care cost on participation - Married mothers

Paramètres	Estimations	Ecarts-type	Significativité
Constant	7.86	1.07	*
Hourly wage (observed, otherwise constructed)	-3.06	0.20	*
Hourly child care cost (observed, otherwise constructed)	-2.48	0.13	*
Number of 1-3 year old children	-0.10	0.09	
Number of 3-11 year old children	-0.50	0.05	*
Number of children over 11	-0.22	0.00	*
Rate of unemployment in the department	0.01	0.06	
Dummy diploma			
2 - professional diploma (CAP, BEP)	0.76	0.01	*
3 - graduate or diploma taken after 2 years	1.14	0.11	*
at University			
4 - over licence	2.42	0.17	*
Non-labor income (log)	0.004	0.01	
Age (/100)	11.65	5.83	*
Age squared (/10 000)	-15.60	8.51	
Size of the urban area			
Rural commune	-0.11	0.11	
Under 10 000 inhabitants urban unit	-0.12	0.13	
10 000-50 000 inhabitants urban unit	-0.28	0.13	*
50 000-2 000 000 inhabitants urban unit	-0.21	0.11	

A.3 Elasticities, marginal effects and simulations

Table 18: Elasticities and marginal effects - Single mothers and married mothers

	Elasticity	Mean marginal effect
Single mothers	**-0.13**	**-0.06**
under poverty threshold	-0.19	-0.09
over poverty threshold	-0.06	-0.03
Married mothers	**-1.27**	**-0.45**
under poverty threshold	-1.30	-0.44
over poverty threshold	-1.27	-0.45

Table 19: Simulation of a decrease in child care costs - Single mothers and married mothers

Labor participation rate	Observed cost	Cost divided by 2
Single mothers	**80.6 %**	**83.4 %**
under poverty threshold	68.6 %	72.3 %
over poverty threshold	94.9 %	96.5 %
Married women	**68.8 %**	**86.5 %**
under poverty threshold	67.7 %	85.4 %
over poverty threshold	69.0 %	86.7 %

B Precisions about calculations

B.1 Likelihood contribution in a Tobit model

The probability of having no job :

$$P(G^* < 0) = P(u_2 < -X_2\epsilon_2) = \Phi(-X_2\epsilon_2)$$

The probability of having a job and a child care cost c :

$$
\begin{aligned}
P(G^* > 0, c = c_1) &= P(E^* > 0/v_2)\frac{1}{\sigma_{u_2}}\phi(u_2\sigma_{u_2}) \\
&= P(u_2 < -X_2\epsilon_2/v_2)\frac{1}{\sigma_{u_2}}\phi(u_2\sigma_{u_2}) \\
&= \frac{1}{\sigma_{u_2}}\phi(u_2\sigma_{u_2})\Phi\left(\frac{X_2\epsilon_2 + \rho_{u_2}u_2}{\sqrt{1 - \rho_{u_2}}}\right)
\end{aligned}
$$

with

$$u_2/v_2 \sim \mathcal{N}\left(\rho_{u_2}u_2\frac{\sigma_{u_2}}{1 - \rho_{u_2}}\right)$$

B.2 Marginal effect and elasticity

The marginal effect of the variable X_{2_k}, which is the kth element of the vector of predictor variables X_k, is :

$$
\begin{aligned}
\frac{\partial P(E^* > 0)}{\partial X_{2_k}} &= \frac{\partial X_2\epsilon_2}{\partial X_{2_k}} \\
&= \epsilon_{2_k}\phi(X_2\epsilon_2)
\end{aligned}
$$

where ϵ_{2_k} is the coefficient of the explanatory variable X_{2_k} in the equation of interest. The elasticity of probability $P(E^* > 0)$ in relation to X_{2_k} is :

$$\frac{\partial P(E^* > 0)/\partial X_{2_k}}{P(E^* > 0)/X_{2_k}} = \frac{\epsilon_{2_k}\phi(X_2\epsilon_2)X_{2_k}}{\Phi(X_2\epsilon_2)}$$