

Reconciling Work and Family Life: The Effect of Preschooling

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ABSTRACT: In France, the number of children has a causal negative impact on mothers' labour market participation. The question addressed in this paper is whether preschooling opportunities reduce this effect. Using the heterogeneity in the geographical distribution of the schooling rate of two-years-old children, I find that preschooling opportunities help only college graduated mothers to reconcile work and family responsibilities when switching from two to more than two children. When they have a high access to preschooling, having more than two children entails an increase of their labour market participation, whereas when their access to preschooling is low, it leads to a decreased participation. However, preschooling opportunities does not reduce the negative effect of having more than one child.

JEL codes: J13, J18, J22.

Key words: fertility, labour market participation, preschooling, mothers, family life.

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1 Introduction

Most French children go to school from the age of three. Before three years old, hardly one third of children have access to a child care public centre or a Nursery assistant. With this level of child care supply, it could be harder for mothers to balance work and family life and thus to stay on the labour market as the number of children increases. For two-years-old children, an alternative to traditional child care is (free) preschooling. This paper studies whether preschooling helps mothers to reconcile work and family life by reducing the negative impact of fertility on mothers' labour market participation.

The question addressed in this paper raises a major methodological issue: the measure of the causal effect of fertility on mothers' labour supply. Fertility may affect mothers' labour supply, but labour supply may also affect fertility, and other observable or unobservable characteristics may affect both fertility and mothers' labour supply. It is thus delicate to provide unbiased estimates of the causal effect of fertility on mothers' labour supply. In an influential contribution, Rosenzweig and Wolpin (1980) use twin births as an instrument to estimate the causal influence of having more children on mothers' participation in the labour market. This strategy relies on the argument that twin births unexpectedly increase the number of children and have an effect on participation only through their impact on fertility.

The analysis of the link between fertility and labour supply to assess conciliation problems is suggested by Brewster and Rindfuss (1996) who argue that "the negative association between fertility and labour force participation can be expected to diminish as the conflict between work and family responsibilities is reduced- whether by a change in the nature of work life, shifts in the social organization of childcare, or a combination of the two". Thus, family policies helping parents to better combine professional and family responsibilities should reduce the negative link between fertility and mothers' labour supply (Bernhardt, 1993; Del Boca et al., 2005). As a result, the time (Foley and York, 2005) and geographical² differences in the negative causal impact of fertility on mothers' labour supply could arise from differences in institutional contexts. Consistently with this literature, I propose to interpret variations in the effect of fertility on labour supply according to differences in preschooling opportunities as variations in conciliation difficulties.

To my knowledge, the question of the link between family policies and the causal effect of fertility on mothers' activity has not been addressed in the literature. A first set of studies uses cross-country analysis to evaluate how family policies alter the correlation between fertility and mothers' work (Brewster and Rindfuss, 2000, Thévenon, 2007) but they focus on correlations and not on causal effects. A second type of studies measures the effect of preschooling on mothers' activity (Cascio, 2006, Goux and Maurin, 2008) but they do not study its effect on the interaction between fertility and mothers' activity.

In France, the schooling of two-years-old children is not an obligation for public services and depends on the number of spaces: the law indicates that children who are two by the start of the new school year can be accepted in pre-elementary public schools if spaces are available (Blanpain, 2006). As a result, the geographical distribution of the preschooling rate is highly heterogeneous: at the beginning of the school year 2005, the schooling rate of two-years-old children varied by departments from 4% to 66%. Considering these differences as exogenous, I assess whether having high or low preschooling opportunities alters the negative impact of the number of children on mothers' labour market participation.

The main contribution of this paper is to estimate the interaction effect between two regimes of preschooling (high/low) and the causal effect of fertility on mothers' labour supply. Pre-elementary

² Whereas the impact of having more than two children on mothers' participation probability is significantly negative in the United States (Angrist and Evans, 1998) and in France (Moschion, 2009), it is insignificant in Great Britain (Iacovou, 2001) and in Canada (Ezzaouali, 2003). Comparing French and American results, it appears that the effect of fertility on mothers' activity is higher in France.

public schools being free, our hypothesis is that for mothers living in a department where preschooling is widespread, the opportunity cost of working is reduced.

I find that the negative effect of having more than one child on mothers' labour market participation is not reduced in departments where preschooling is widespread. Preschooling opportunities help only college graduated mothers to reconcile work and family life when switching from two to more than two children. On this subsample, having more than two children has a negative impact on mothers' labour market participation when preschooling is rare, but a positive impact when preschooling is widespread. These results suggest that supplying more preschooling would help a specific category of mothers.

The paper is organised as follows. Section 2 provides a short discussion of related literature and section 3 describes the data. Section 4 gives some descriptive statistics and section 5 discusses the exogeneity assumptions. Section 6 presents the model and section 7 gives the results. Last section concludes.

2 Related literature

Recent French studies underline that balancing work and family life could be hardened by insufficient child care supply (Méda, 2006, Péresse report 2007). However, they do not evaluate the effect of child care on the causal effect of fertility on mothers' labour supply.

One strand of the literature assesses the effect of child care costs³ and availability on fertility on the one hand, and on mothers' activity on the other hand. This literature puts forward the fact that the difficulty to find child care facilities for children aged less than three could incite mothers to reduce or cease their professional activity to take care of their child⁴ particularly in disadvantaged backgrounds. Using Italian panel data, Del Boca (2002) shows that in Italy, the short supply of child care and the incompatibility of opening hours with a full time work account partly for the low rates of fertility and women's participation in the labour market. Cascio (2006) uses the fast increase in the preschooling of five-years-old children in some American states to identify the effect of public child care supply on mothers' activity. Difference-in-difference estimates show that preschooling possibilities increase the employment of single mothers but has no effect on the employment of married mothers. Herbst and Barnow (2008) propose different instruments to identify the causal effect of local child care supply on mothers' activity: an indicator of informal child care, the proportion of people working at home and the supply of places in the "Head Start" preschool program. Instrumental variable estimates on American data suggest that a hundred spaces increase in the local supply of child care would increase mothers' labour market participation by 1.3 percent points. On the whole, as the typology of child care services becomes more precise, the impact of child care costs on mothers' activity decreases (Perraudin and Pucci, 2007). High child care costs induce substitutions between the different kinds of child care (and especially formal and informal) rather than a decrease in mothers' participation in the labour market.

Using the progressive increase in preschooling in France since 1977 and the heterogeneity in its geographical distribution, De Curraize (2005) tries to identify the causal effect of pre-elementary public schools' availability on the employment rate of mothers with young children. He compares the employment rate of mothers' whose youngest child is two-years-old with that of mothers' whose

³ Blau and Robins (1989) show that higher child care costs are associated with lower fertility and lower mothers' labour supply in 1980 in the United States. Other studies on American data confirm the negative impact of child care costs on mothers' labour supply (Connelly, 1992, Ribar, 1992). On Canadian data, Powell (2002) finds that child care costs reduce mothers' working probability. Laroque and Salanié (2008) estimate on French data that a monthly childcare credit of 180 euros per child under three would increase fertility by 13.4%. Choné, et al. (2004) find that child care costs have a little influence on women's participation decisions.

⁴ According to the Observatoire national de la petite enfance (2006), among children living with their two parents and having a mother who works part time, 10% have a mother who works part time because of the lack of child care or because it is too expensive.

youngest child is less than two-years-old. Difference in difference estimates suggest that the effect of preschooling on mothers' employment rate is significant only at the 10% level. Goux and Maurin (2008) use the fact that the preschooling probability varies with the child's birth date to evaluate its effect on mothers' activity. The idea is that the month of birth is a random shock affecting the child's probability to go to school a given year. For a child born in December 1995, the probability to go to school the year he turns three-years-old is 90%. If he is born in January 1996, that is a month later, the probability that he goes to school the same year is only 70%. For mothers in couple, no such discontinuity appears in their activity rate in March 1999 depending on whether their child is born in December 1995 or January 1996. In contrast, the activity rate of single mothers is 83% if their child is born in December 1995 and 79% if he is born in January 1996. The hypothesis is that if the child were born in December, his mother's probability of activity would have increased precisely because the probability that her child would have gone to school would have been higher. Results indicate that preschooling has a significant positive effect on single mothers' activity rate.

Another strand of the literature tries to identify if family policies help to balance work and family life, in the sense that they reduce the correlation between fertility and mothers' labour supply. They study if when, at the country level, the correlation between fertility and mothers' activity becomes less negative, or even positive⁵, this could be attributed to the success of specific family policies. Brewster and Rindfuss (2000) synthesise European and American researches on the link between fertility and women's work, and on the impact that various policies may have on this relationship. They focus on the reversal of the correlation between fertility and mothers' labour supply at the country level: fertility rates tend to be higher in the countries where the participation rate of women in the labour market is also high. According to the authors, it suggests that in some countries, women succeeded in combining family and professional responsibilities, and in others they did not. Thévenon (2007) studies for the OECD countries the link between different family policies and their performances in terms notably of fertility and women's work. He confirms that a high participation rate of women in the labour market is not contradictory with a high fertility, but that it depends on family policies.

These results suggest that in step with implemented family policies, the link between fertility and mothers' activity varies. However, by using cross-country analysis to evaluate how family policies may alter the link between fertility and mothers' work, these studies do not demonstrate causal relationships. First, because historical and cultural differences between countries may explain both that different policies are implemented and that fertility and mothers' labour supply behaviours differ. In this context, it is hard to establish a causal link between family policies and fertility-labour supply behaviours. To avoid this issue, I focus on France. Second, these studies focus on the correlation between fertility and mothers' labour supply rather than on the causal effect. Their results are thus delicate to interpret. Do mothers having more children have a lower activity rate because fertility affects negatively their labour supply (constraints) or because they share common characteristics and preferences (choice)? I use a random source of fertility variation (twin births) to disentangle the correlation and identify precisely the causal effect of fertility on mothers' labour supply.

3 Data description

The data used in this paper come from the 13 French Labour Force Surveys (LFS) conducted each year between 1990 and 2002 by the French Statistical Office (INSEE). The sample of the LFS is representative of French metropolitan population aged fifteen and more ($N=135,000$, sampling rate= $1/300$). For each respondent, it provides his birth date, sex, family situation, diploma and participation in the labour market. For each household, it contains information on the number, sex and birth date of each child living in the housing.

Using data from the Ministry of Education, I distinguish two types of departments: the ones where preschooling is widespread and the ones where it is rare. Two-years-old schooling rates are available in 1997 and 2003 (appendix 1)⁶. The group of high preschooling rate contains the 30 departments that were in the first third in 1997 and in 2003 (I remove those whose schooling rate for two-years-old

⁵ The development in the 1990's of a positive correlation between fertility and mothers' labour supply at the national level has been emphasized by several authors (i.e. Bernhardt, 1993; Brewster and Rindfuss, 1996).

collapsed between 1997 and 2003⁷). In the same way, the group of low preschooling rate gathers the 32 departments that were in the last third in 1997 and 2003 (I remove those whose schooling rate for two-years-old collapsed or increased importantly between 1997 and 2003⁸). The list of departments in each group is given in appendix 2.

I focus on mothers in couple aged 21 to 35 with at least one child aged two at the time of the survey. To study the impact of having more than one child, the sample contains mothers with at least one child (N=12,501). Symmetrically, to study the impact of having more than two children, the sample is restricted to mothers with at least two children. (N=7,726). More precisely, in the first case, I keep mothers whose first child (if they had only one) or second child (if they had more than one) is two-years-old. In the second case, I keep mothers with two children whose second child is two-years-old and mothers having three children or more whose third child is two years old. Therefore the sample selection is not made on the total number of children which would bias the samples, but on the age of children. I select mothers having at least two (resp. three) children according to the age of the second (resp. third) child rather than the age of the last child, so that I can compare mothers' activity when the first (resp. second) and second (resp. third) child are in the same age group. Moreover, the age of the last child is correlated with the number of children: as the number of children increases, the age of the youngest decreases, and the probability that his mother is in the samples increases. In this case, our samples would be biased: mothers having more than two (resp. three) children would be overrepresented compared with mothers having just two (resp. three).

As Angrist and Evans (1998) and Moschion (2009), because I have information only on children who still live with their parents, I restrict the sample to mothers aged 21 to 35. This prevents us from underestimating the total number of children and from introducing errors on the rank of siblings. Women who are more than 35 years old potentially have of-age children, who have a higher probability to leave outside the parental home, and thus be outside of the survey. Selecting mothers aged 21 to 35 is not completely neutral and I check that selecting the larger sample of mothers aged 21 to 40 give similar results.

4 Descriptive statistics

Table 1 gives some descriptive statistics. In the sample of mothers with at least one child, nearly 50% have at least a second child. For mothers with at least two children, about 30% have at least three children. In this sample, eldest siblings are same sex in half cases and about 1% of second births were twins.

I present in the second part of table 1 descriptive statistics of demographic variables. In our first sample, mothers are in average 29 years old and had their first child at about 25 years old. 27% of mothers in the sample have no diploma and about 27% graduated from college. Mothers with more children (second column) are slightly older, had their first child younger and are less graduated. Compared to the general population, the mothers in our samples had their first child younger. The average age at maternity (first child) being 26 in 1990 (Ined). Mothers with at least two children are also less graduated: In the period 1990-2002, 28% of women aged 21 to 35 had no diploma and 27% had a higher diploma than the school-leaving certificate (LFS, 1990-2002). These features are not independent of the research question and may result from either the selection of mothers according to the number of children or to their age (considering that they have at least two children). Comfortingly results are similar on the sample of mothers aged 21 to 40.

TABLE 1

⁶ I have no similar data for previous years, but the distribution of the schooling rate of two-years-old is stable over time (Martin and Papon, 2008). As a result, our partition is very close to that of De Curraize (2005) who uses older data.

⁷ Those departments are Meurthe-et-Moselle, Rhône, Allier, Alpes de haute Provence, Aude and Vienne.

⁸ Those departments are Aube, Gard, Pyrénées Orientales, Dordogne, Doubs and Haute Saône.

The third part of table 1 gives descriptive statistics on labour supply. I call “labour market participation rate” the percentage of mothers in our sample that are working or unemployed. I chose to use activity rates, i.e. I include unemployed, rather than employment rates because the objective is to study how preschooling modifies the effect of fertility on working decisions. Yet, an unemployed woman has a priori decided to work, which is not the case of an inactive woman. Even though the frontier between the two situations is rather vague, it seems relevant to consider activity rates rather than employment rates which would lead us to consider the actual employment status of mothers rather than the decision they took. The labour market participation rate in our samples are 72% for mothers with at least one child and 52% when they have at least two children. For the number of hours worked per week, the sample is restricted to employed mothers working between 10 and 60 hours per week. In average, they work respectively 35 and 33 hours per week.

5 Exogeneity of preschooling

The interpretation of our results rests on the assumption that preschooling groups are exogenous: having a high/low preschooling rate is not due to temporal features of departments that also affect the impact of fertility on mothers’ labour supply⁹. If this assumption is not verified, I cannot conclude that preschooling is responsible for the variations in the causal effect of fertility on mothers’ labour supply.

I suppose that:

$$E(y_0/x = 1, \text{high rate} = 1) - E(y_0/x = 0, \text{high rate} = 1) = E(y_0/x = 1, \text{high rate} = 0) - E(y_0/x = 0, \text{high rate} = 0)$$

Where the first term is the expected activity rate of mothers (y) with more than one or two children (x) living in departments where preschooling is high under the hypothesis that this rate would have been low; the second is this expectation for mothers with one or two children; the third is this expectation for mothers with more than one or two children living in departments where preschooling is rare; and the fourth, this expectation for mothers with one or two children. It is not necessary to suppose that activity levels would be identical, only that the difference in activity rates according to the number of children would be identical in both types of departments. This implies that the difference in the elasticity of mothers’ activity rate according to the number of children across departments is not explained by unobserved temporal heterogeneity between departments.

Also, variations in the schooling rate should not be caused by differences in the elasticity of mothers’ activity rate according to the number of children. First, the conditions in which two-years-old children can access pre-elementary public schools do not depend on the number of two-years-old living in the department and thus on the potential demand for additional spaces. The law indicates that children aged two by the start of the new school year can attend pre-elementary public schools in the limit of available spaces. Preschooling is not an obligation for the educative system and the administration does not adapt the number of spaces for two-years-old to the demand. Procedures for opening and closing classrooms rely on the number of pupils without taking into account children under three (Martin and Papon, 2008). An objective is rather to maintain school networks in rural areas or stimulate children outcomes in disadvantaged background. Article 2 of the orientation law on education of July 1989 indicates that “the access of two-years-old children is first extended to schools located in a disadvantaged background, whether it is in urban, rural or mountainous areas” (translated by the author). The idea is that the schooling of two-years-old could substitute efficiently for a lack of cultural stimulation inside the home, and thus reduce social disparities and academic failure. In the end, preschooling is higher in rural areas and in towns that count less than 20 000 inhabitants, but not in disadvantaged backgrounds (Caille, 2001, Martin and Papon, 2008).

Second, demographic evolutions maintained existing geographical disparities. In “less dynamic” departments, where the population decreases, the already high schooling rate for two-years-old continued to increase during the 1990’s. In particular, two-years-old filled classrooms in rural areas to

⁹ In the different regressions, I include department dummies to capture structural differences between departments that could eventually explain differences in preschooling.

avoid their closing. On the contrary, in “more dynamic” departments, where the population increases, the already low schooling rate for two-years-old continued to decrease (Martin and Papon, 2008). For a given number of first-year classrooms, the size of the three-years-old cohort determines the preschooling rate. The application of article 2 of the orientation law on education of July 1989 was not coordinated and organized, but depended on the local demographic evolution. There is no reason to think that the demand for preschooling is higher in departments where the population decreased.

The recent demographic evolution confirms that the schooling of two-years-old does not adjust to parents’ demand: the “baby-boom” of year 2000 led to an increase in the number of three-years-old starting school in September 2003. This did not lead to an opening of more classrooms (to maintain the local schooling rate of two-years-old) and the principle according to which the preschooling is not an obligation for the educative system was reaffirmed. As a consequence, independently of parents’ potential demands, the schooling rate of two-years-old decreased everywhere since 2003: from 32% for the 2002-2003 schooling year to 21% in 2007-2008 (Martin and Papon, 2008)¹⁰.

The schooling of two-years-old is more frequent in rural areas which could have specific characteristics affecting the effect of fertility on mothers’ activity. However, Moschion (2009) shows that this effect does not vary with the size of the town of residence. Also, departmental dummies are included in the regressions to control for potential structural differences between high and low rate departments.

Another concern about the exogeneity of the preschooling rate could arise from potentially endogenous strategies: when switching from n to more than n children, active mothers living in departments where preschooling is low could try to send their child to school in departments with higher preschooling opportunities. However, it is hardly plausible that parents would send their two-years-old child to school far away from home or move and change jobs to benefit from higher preschooling rates.

6 Model

The model used in this paper is inspired from Angrist and Evans (1998). I estimate a two-stage linear probability model where the second-stage equation links labour market participation to fertility. The labour market participation variable is a dummy indicating whether the mother participates in the labour market or not (it is equal to one if the mother works or is unemployed). The explanatory variables of interest are interaction variables between fertility variables and a dummy that indicates whether the household lives in a department where the schooling rate for two-years-old is high or low. Two fertility variables (x_i) are considered: ‘*more than one child*’, which is a dummy equal to one if the mother has two children or more and ‘*more than two children*’, which is a dummy equal to one if the mother has three children or more.

The labour market participation variable y_i is linked to fertility ($x_i * highrate_i$ and $x_i * lowrate_i$) and to other covariates w_i by the following equation:

$$y_{itd} = \alpha_0 w_{itd} + \alpha_3 highrate_d + \beta_1 x_{itd} * highrate_d + \beta_2 x_{itd} * lowrate_d + \varepsilon_{itd} \quad (1)$$

The dummy ‘*highrate*’ equals 1 if the household lives in a department where the schooling rate for two-years-olds is high. The interaction variable between ‘*more than n children*’ (x_i) and ‘*highrate*’ equals 1 if the mother had an ($n+1$) child and the family resides in a department where the schooling rate for two-years-old is high. The coefficient β_1 gives the effect of switching from n to ($n+1$) children on the activity probability of mothers who have a high probability to preschool their children. I compare this coefficient with β_2 which gives the effect of switching from n to ($n+1$) children on the activity probability of mothers who have a low probability to preschool their children. The dummy

¹⁰ This variation of the preschooling rate is not exogenous and thus cannot be used to identify how preschooling alters the impact of the number of children on mothers’ labour market participation. It results from a modification of fertility behaviour that could affect the link between fertility and mothers’ activity, independently from its consequences on the probability that children aged two can intend school.

variable '*highrate*' is also included alone in the regressions. The coefficient associated with this variable (α_3) gives the direct effect of the two-years-old's schooling rate on mothers' labour market participation.

The other covariates are age, age at first birth, diploma, immigrant status, year fixed effects, department fixed effects, an indicator for the reform of the *Allocation parentale d'éducation*, and the sex of the first sibling. The immigrant status variable is a dummy indicating whether the woman is French born or not. The year-fixed effects are dummies for each year in our sample and department fixed effects are dummies for each French department included in the analysis. They are introduced to control for temporal and geographical unobserved heterogeneity that may affect outcomes. The level of diploma is introduced with 5 dummies indicating whether the mother has no diploma, dropped out from high-school, graduated from high-school, has a bachelors' degree or more than a bachelors' degree. When the fertility variable is the probability to have more than two children, additional covariates are age difference between the two first siblings (in months) and the sex of the second sibling. The age at first birth and the time interval between the first and second birth are correlated with the probability of having more children (Breton and Prioux, 2005). An early first birth and a short time interval between the two first births may come from a desire to have many children. Young mothers may have a particular profile in terms of background, level of diploma, nationality... The inclusion of these two variables captures some of the unobservables that may affect the probability to have more children and to participate in the labour market.

To correct for the endogeneity of fertility decisions and obtain unbiased estimates of the causal effect of fertility on mothers' labour supply, I use two equations which link the fertility variables to the instruments. The instruments are interaction variables between a random shock affecting the number of children and the dummies '*highrate*' and '*lowrate*' that indicate whether the household lives in a department where the schooling rate for two-years-old is high or low. Different fertility shocks are considered. I finally use the birth of twins at the first and the second pregnancy¹¹. The first-stage regressions connecting fertility variables to the instruments ($twins_i * highrate_i$ and $twins_i * lowrate_i$) are:

$$x_{iid} * highrate_d = \pi'_0 w_{iid} + \pi_3 highrate_d + \gamma_1 twins_{iid} * highrate_d + \gamma_2 twins_{iid} * lowrate_d + \eta_{iid} \quad (2)$$

$$x_{iid} * lowrate_d = \pi'_4 w_{iid} + \pi_7 highrate_d + \gamma_3 twins_{iid} * highrate_d + \gamma_4 twins_{iid} * lowrate_d + v_{iid} \quad (3)$$

The interaction variable between '*twins-1*' (resp. '*twins-2*') and '*highrate*' equals 1 if the mother had twins at the first birth (resp. at the second birth) and that the family resides in a department where the schooling rate for two-years-old is high. In equation (2), the coefficient γ_1 gives the effect of having twins at the first birth (resp. at the second birth) on the probability to have more than one (resp. two) children, for mothers who had a high probability to preschool their children. I compare this coefficient with γ_4 which gives the effect of having twins at the first birth (resp. at the second birth) on fertility for mothers who had a low probability to preschool their children.

The use of a two-stage linear probability model is justified by the fact that fertility decisions are endogenous. Thus, ordinary least squares provide biased estimates of the effect of fertility on mothers' labour supply. I use instrumental variables that affect the number of children of each mother but have no direct effect on her activity decision. When the endogenous explanatory variable is a dummy, another solution to endogeneity issues is the use of simultaneous equations with a probit regression in the first-stage (Heckman, 1978). But following Heckman (1978), when exogenous instrumental variables are available, "Since the linear probability procedure is the simplest one to use, it is recommended". Another argument pleads in favour of linear probability models since no assumptions on the residuals are necessary and according to Heckman and Macurdy (1985), the use of a two-stage linear probability model is justified when one considers simultaneous equations where the instrument, the endogenous variable and the dependant variable are dummies. Angrist and Evans (1998) as well as Conley (2004) use a model of this type to estimate the impact of fertility on women's labour supply.

¹¹ The sex of the two eldest siblings was considered an alternative instrument, but for reasons explained in the next section, it could not be used.

7 Results

7.1 The effect of having same sex eldest siblings or twins on fertility

I report in Table 2 the results of the estimations of equation (2) in the two first columns and equation (3) in the third and fourth columns for the different fertility variables and the different instruments.

The first part of table 2 shows that whatever the schooling rate for children aged two in the department, having twins at the first birth increases the probability to have a second child by about 50 percent points. In the second part of table 2, I show similar results for the birth of twins at the second birth: having twins of rank two and three increases the probability to have three children by about 80 percent points. An important feature of these results is that there is no significant difference between first stages effects according to the schooling rate for two-years-old children.

I also considered the birth of same sex eldest siblings as an alternative instrument for the probability to have more than three children. In France having same sex eldest siblings increases the probability to have more than three children (Breton and Prioux, 2005). This event has been used as an instrument for switching from two to more than two children in the United States (Angrist and Evans, 1998) and in France (Moschion, 2009) for example.

The second part of table 2 shows that having same sex eldest siblings increases the probability to have a third child only in departments where preschooling is rare. The first stage effect is insignificant in departments where preschooling is widespread. Thus, the instrument ‘*same sex*’ cannot be used on this sample to identify the effect of fertility on mothers’ labour market participation. I thus enlarged the sample to mothers with at least one of the three first children aged two to ten to increase the sample and consequently the precision of the estimates. On this sample, having same sex eldest siblings increases the probability to have a third child by 1.7 percent points for mothers who could easily preschool their children (high rate departments), and by 4.5 percent points in high rate departments. Coefficients are significant at the 1% level, but differ from one another. Different results in instrumental variable estimates could thus come from differences in first stage effects that could not be disentangled from differences due to different schooling rates for two-years-old. Another drawback of this strategy comes from the fact that labour force surveys give no information on the family’s department of residence at the time their second or third child was two. As they may have moved between the time their child was two and ten, I chose not to use this strategy to identify the impact of switching from two to more than two children on mothers’ labour market participation.

The quality of instrumental variable estimates depends on the quality of instruments. In the regressions of fertility variables ($x_i*highrate_i$ and $x_i*lowrate_i$) on the instruments ($twins_i*highrate_i$ and $twins_i*lowrate_i$) with no other covariates, the Fisher statistics are respectively 28 and 91 in high and low rate departments when the fertility variable is “*having more than one child*” and the instrument is the birth of twins at the first pregnancy. When the fertility variable is “*having more than two children*” and the instrument is the birth of twins at the second pregnancy, the Fisher statistics are respectively 56 and 138. They are thus higher than 10, validation criterion that has emerged in the literature (Bound, Jaeger and Baker, 1995)¹². These instruments are powerful enough; they explain well the endogenous fertility variables.

TABLE 2

In the rest of the paper, to identify how preschooling opportunities alter the impact of fertility on mothers’ labour market participation, I use ‘*twins-1*’ to instrument the leap from one to more than one child, and ‘*twins-2*’ to instrument the leap from two to more than two children.

¹² For the instrument “*same sex*” on the extended sample of mothers with children aged two to ten, I find Fisher statistics of 6 and 54. In departments where preschooling is low, this is insufficient and comforts us with the use of twins as instruments.

This identification strategy relies on the fact that the twin births are randomly distributed. In other words, they are independent of the department where the family lives and of mothers' individual characteristics.

I checked that there was no bias due to endogenous location of households, namely that households' geographical distribution according to the birth of twins is random. In departments where preschooling is high (resp. low), the observed number of households with twins at first and second births is identical to the theoretical number¹³ (table 3). In particular, there are not more households with twins in the departments where preschooling is low. If this was not the case, it could be that the higher negative correlation between twin births and mothers' labour supply in these departments is fallacious. This higher negative correlation would not come from the low preschooling rate, but from a coincidence of two phenomena: preschooling is low, and because there are more families with twins, mothers' labour supply is lower. Insofar as households with twins are randomly distributed, having twins is not correlated with local characteristics. Thus, instrumentation enables to measure the causal effect of having more than one and more than two children on mothers' labour supply and geographical differences in preschooling explain the difference of this effect.

TABLE 3

I also check whether twin births are correlated with individual characteristics that could explain that mothers with twins work less than other mothers (table 4).

It is well known that the probability of having twins is higher for older mothers. As a result, I find that mothers with twins had their first child later. Mothers with twins at the second birth are also more often French natives and more graduated. All these characteristics, which are positively correlated with mothers' participation in the labour market, would rather explain a higher participation in the labour market of mothers with twins than a lower one. These characteristics are introduced in the regressions.

TABLE 4

7.2 The effect of fertility on mothers' labour market participation

I report in Table 5 the results of ordinary least square and two-stage least square estimations of the effect of having more than one and more than two children on mothers' labour supply (equation 1). The activity rate of mothers is almost identical in both types of department: for mothers with at least two children, it is 49.8% in departments where preschooling is high and 53.6% where it is low.

TABLE 5

In the first part of table 5, results of OLS estimations show that other things being equal, mothers reduce more their participation in the labour market when switching from one to more than one child in departments where preschooling is widespread than where it is rare. The birth of a second child is associated with a lower probability of mothers' labour market participation by 18.8 percent points in departments where preschooling is high and by 14.2 percent points when it is low. When fertility is instrumented by the birth of twins at the first pregnancy, estimates confirm this trend but estimates are not significantly different. Whatever the department of residence, having more than one child has a negative impact on mothers' labour supply: the estimated coefficient is -0.590 in departments where preschooling is high and -0.349 in departments where it is low. The difference between the estimates (0.241 (0.213)) is not statistically significant. As a result, free child care possibilities do not reduce labour market withdrawals after the birth of a second child.

¹³ For the departments where the schooling rate for two-years-old is high (resp. low), the theoretical number of households with twins is equal to the product of the total number of households with twins in my sample by the proportion of observations that belong to the group where the schooling rate for two-years-old is high (resp. low).

In the second part of table 5, ordinary least square estimates show that whatever the schooling rate for two-years-old children, mothers with more than two children participate less in the labour market than mothers with two children by about 30 percent points. When '*twins-2*' is used as an instrument, the effect of having more than two children on labour market participation is significantly negative in both types of departments: -0.251 where preschooling is high and -0.269 where it is low. The difference between the estimates is not statistically significant¹⁴.

When the sample of mothers aged 21-40 is considered, first stages, ordinary least squares and two-stage least squares results are confirmed and statistical significance levels are identical. For example, when '*twins-2*' is the instrument, I find that having more than two children reduces significantly mothers' labour market participation by 25.7 percentage points when the family lives in a department where preschooling is rare (the effect is 26.9 on the 21-35), and by 25.7 percent points when the family lives in a department where preschooling is high (the effect is 25.1 on the 21-35).

7.3 Mothers' level of diploma

The schooling rate for two-years-old may affect differently the impact of fertility on mothers' labour supply according to mothers' level of diploma. I reproduce the previous analysis on two sub samples: high school graduates at the most and college graduates.

In the first part of table 6, ordinary least square estimates confirm that the negative correlation between having more than one child and mothers activity is slightly higher in departments where preschooling is high. As expected, this correlation is significantly higher for less graduated mothers: in departments where preschooling is high, mothers' activity probability is lower by 20 percent points when having more than one child for less graduated mothers and by 14 percent points for more graduated mothers. Instrumental variable estimates confirm results on the whole sample: whatever the mothers' level of diploma, having more than one child has a negative impact on mothers' labour supply in both types of departments and the difference between the estimates is not statistically significant: it is 0.275 (0.248) for high school graduates at the most and 0.299 (0.494) for college graduates. Preschooling thus does not appear to help mothers to reconcile work and family life when switching from one to more than one child.

In the second part of table 6, ordinary least square estimates confirm that the correlation between having more than two children and mothers activity is not different across types of departments. They also confirm that the link between the number of children and mothers' activity is higher for less graduated mothers: mothers' probability of labour market participation is reduced by 32 percent points when having a third child for less graduated mothers and by 21 for more graduated mothers.

When '*twins-2*' is used as an instrument to study separately more and less graduated mothers, the estimates show that the effect of preschooling differs according to the mothers' level of diploma. For college graduates, having more than two children significantly increases labour market participation in departments where preschooling is high (0.275), whereas it decreases it in departments where preschooling is low (-0.226). Thus, when balancing work and family life is easier, the income effect of the number of children prevails: when the number of children increases, education costs increase, and mothers' labour supply increases. When they live in a department where preschooling is low, reconciling work and family life is harder and when they have more than two children, they withdraw from the labour market. The difference between the coefficients is significant¹⁵ showing that more graduated mothers are particularly sensitive to free child care availability.

For less graduated mothers, having more than two children significantly reduces labour market participation, this reduction being similar in departments where preschooling is low (-0.300) and in departments where it is high (-0.317).

¹⁴ The difference between the two coefficients is $0.269 - 0.251 = 0.018$ with a standard error of $(0.083^2 + 0.128^2)^{0.5} = 0.153$.

¹⁵ The difference between the two coefficients is $0.275 + 0.226 = 0.501$ with a standard error of $(0.098^2 + 0.131^2)^{0.5} = 0.164$.

Altogether, preschooling possibilities help college graduated mothers to balance work and family life when switching from two to more than two children. In other cases (less graduated mothers or leaps from one to more than one child) preschooling does not seem to help mothers to stay on the labour market when the number of children increases.

TABLE 6

7.4 The effect of fertility on fathers' labour market participation

The same analysis is conducted on fathers in couple aged 21 to 35 (table 7).

TABLE 7

In the first part of table 7, instrumental variable estimates show that switching from one to more than one child increases fathers' labour market participation in both types of departments: by 0.021 when preschooling is high and by 0.026 when it is low. These effects of the number of children on fathers' labour supply are very small (around 2 percent points) compared with effects on mothers' (more than 30 percent points): as a matter of fact, fathers' activity rate is already very high and cannot increase much whereas mothers' activity rate decrease a lot as the number of children increases.

In the second part of table 7, instrumental variable estimates show that when preschooling is rare, the impact of switching from two to more than two children on fathers' labour market participation is not significant. On the contrary, when it is widespread, having more than two children increases fathers' participation in the labour market by 2.2 percent points.

These results confirm that mothers are in charge of the conciliation between work and family life. When the number of children increases, mothers reduce their activity to make the adjustment between work and family life. On the contrary, fathers increase their labour supply.

7.5 Discussion

The beneficial effect of preschooling is rather low and limited to a very specific population: mothers with a college degree who have more than two children¹⁶. Two hypotheses could explain this result.

Firstly, schools' opening hours are too short to help mothers reconcile family life with a full-time job as the number of children increases. As a result, whatever the preschooling rate, when the number of children increases, mothers withdraw from the labour market. This could be especially true for the leap from one to more than one child as mothers with at least one child are less often in part-time jobs (32%, table 1) and might be reluctant to accept part-time jobs when switching from one to more than one child.

Secondly, preschooling opportunities complement the supply of traditional child care services. Pre-elementary public schools are not intended for two-years-old children, and are thus maladaptive. The main advantage of preschooling compared to child care is that it is free. Our results indicate that free child care opportunities compared with traditional child care benefit to mothers who are highly educated. This counterintuitive result could in fact come from the fact that low income families benefit from a preferential access to low cost child care services (nursery schools). As a result, they can access traditional child care services more easily and at a cheaper price than other families. This might reduce their interest in preschooling and explain why preschooling opportunities do not reduce the negative impact of fertility for mothers with a high-school degree at the most. On the contrary for college graduated mothers, preschooling can induce a substantial reduction in child care costs compared to other types of child care. This could be a reason why for this population, preschooling alters the effect of switching from two to more than two children.

¹⁶ Among mothers in couple aged 21 to 35, only 19% have a college degree, and among them only 11% have more than two children.

8 Conclusion

This paper proposes a two-stage linear probability model where the interaction between the local preschooling rate and fertility (instrumented by twin births) enables us to compare the effect of fertility on mothers' activity probability according to the level of preschooling.

Concerning the leap from one to more than one child, preschooling does not help mothers to reconcile work and family life. Switching from one to more than one child has a negative impact on mothers' labour market participation in departments where preschooling is rare, but also when it is widespread. This result also holds when mothers who graduated from high-school at the most are distinguished from mothers who graduated from college. On the contrary, switching from one to more than one child increases fathers' labour market participation; but as for mothers this effect is similar in both types of departments.

When switching from two to more than two children, preschooling opportunities help mothers who graduated from college to reconcile work and family life. Having more than two children increases their activity probability in departments where preschooling is widespread, whereas their activity probability is decreased in departments where preschooling is rare. Fathers also seem to benefit from high preschooling rates: when switching from two to more than two children, they slightly increase their labour market participation only if the local preschooling rate is high.

In all cases studied, mothers are the ones who reduce their participation in the labour market to make the balance between work and family life. If anything, when the number of children increases, fathers raise their labour market participation.

The beneficial effect of preschooling is rather low and limited to a restricted sample: mothers with a college degree who have more than two children (11% of mothers with a college degree). Two hypotheses could explain this result: the inadequacy of school opening hours with a full-time job and the fact that low income families have a higher access to low cost child care services. The fact that preschooling is free thus does not seem determinant, and the development of cheap child care adapted to children under three could have a higher impact on mothers' labour supply since it could encourage mothers who did not want to preschool their children to stay on the labour market when the number of children increases.

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TABLE 1 - *Descriptive statistics, women in couple aged 21-35*

Variable	Means and (standard deviations)	
	With at least one child	With at least two children
Fertility characteristics		
Number of children	1.50 (0.55)	2.30 (0.49)
Women with more than one/two children ⁽¹⁾	0.470 (0.499)	0.282 (0.450)
First two children are same sex ⁽¹⁾	-	0.506 (0.500)
Twin births at first/second birth ⁽¹⁾	0.008 (0.090)	0.009 (0.097)
Sociodemographic characteristics		
Age	29.1 (3.4)	30.5 (3.1)
Age at 1st birth	25.4 (3.5)	23.9 (3.4)
No diploma ⁽¹⁾	0.266 (0.442)	0.339 (0.473)
Graduates from high school or less ⁽¹⁾	0.469 (0.499)	0.442 (0.497)
Graduates from college ⁽¹⁾	0.265 (0.441)	0.219 (0.413)
Labour supply characteristics		
Labour market participation ⁽¹⁾	0.720 (0.449)	0.522 (0.499)
Average hours worked per week	34.5 (9.0)	33.3 (9.6)
Part-time work	0.325 (0.468)	0.428 (0.495)
Number of observations	12,501	7,726

SAMPLE: women with a spouse aged 21-35. In the first column, the sample is restricted to mothers with at least one child and one of the two first children aged two. The second column, the sample is restricted to mothers with at least two children and one of the three first children aged two.

NOTE 1: these are proportions.

SOURCE: labour force surveys 1990-2002, Insee.

TABLE 2 - *The effect of having same sex eldest siblings or twins on the fertility of ranks two and three*
Ordinary least square estimates

Dependant variable:	<i>More than 1 child * ...</i>			
	<i>... High rate</i>		<i>... Low rate</i>	
First or second child is 2 years-old				
<i>Twins-1 * High rate</i>	0.514*** (0.057)	0.498*** (0.051)	0.000 (0.077)	0.025 (0.060)
<i>Twins-1 * Low rate</i>	0.000 (0.034)	-0.043 (0.031)	0.546*** (0.046)	0.511*** (0.036)
<i>R</i> ²	0.3873	0.5126	0.2385	0.5375
<i>N</i>	12,501	12,501	12,501	12,501
Dependant variable:	<i>More than 2 children * ...</i>			
	<i>... High rate</i>		<i>... Low rate</i>	
Second or third child is 2 years-old				
<i>Same sex * High rate</i>	0.016 (0.010)	0.010 (0.009)	0.000 (0.013)	-0.005 (0.011)
<i>Same sex * Low rate</i>	0.000 (0.008)	-0.001 (0.007)	0.028*** (0.013)	0.025*** (0.008)
<i>R</i> ²	0.2082	0.3579	0.1243	0.396
<i>Twins-2 * High rate</i>	0.710*** (0.058)	0.789*** (0.052)	0.000 (0.073)	0.115* (0.060)
<i>Twins-2 * Low rate</i>	0.000 (0.039)	0.061* (0.035)	0.734*** (0.049)	0.827*** (0.041)
<i>R</i> ²	0.2231	0.363	0.1477	0.4265
<i>N</i>	7,726	7,726	7,726	7,726
Second or third child is 2 to 10 years-old				
<i>Same sex * High rate</i>	0.020*** (0.005)	0.017*** (0.005)	0.000 (0.006)	0.000 (0.006)
<i>Same sex * Low rate</i>	0.000 (0.004)	-0.002 (0.004)	0.046*** (0.005)	0.045*** (0.004)
<i>R</i> ²	0.251	0.363	0.1509	0.3204
<i>N</i>	35,412	35,412	35,412	35,412
Other covariates	No	Yes	No	Yes

Levels of significance: * : 10% ** : 5% *** : 1%

SAMPLE: women with a spouse aged 21 to 35. In the first part of the table, the sample is restricted to mothers with at least one child and one of the two first children aged two. In the second part of the table, the sample is restricted to mothers with at least two children and one of the three first children aged two.

NOTE: standard errors (in parentheses) are adjusted for potential serial correlation. Other covariates are age, age at first birth, diploma, immigrant status, year fixed effects, department fixed effects, an indicator for the reform of the *Allocation parentale d'éducation*, and the sex of the first sibling. When the dependant variable is the probability to have more than two children, additional covariates are age difference between the two first siblings (in months) and the sex of the second sibling. The main effect for the schooling rate at two-years-old is included in the regressions.

SOURCE: labour force surveys 1990-2002, Insee.

TABLE 3 – *Theoretical and observed number of families with twins at first or second birth according to the preschooling rate*

	High rate	Low rate
Theoretical number of twins-1	36	67
Observed number of twins-1	27	76
Khi-2 statistic	2.343	1.271
Theoretical number of twins-2	27	46
Observed number of twins-2	23	50
Khi-2 statistic	0.681	0.407

SAMPLE: women with a spouse aged 21 to 35. In the first part of the table, the sample is restricted to mothers with at least one child and one of the two first children aged two. In the second part of the table, the sample is restricted to mothers with at least two children and one of the three first children aged two.

SOURCE: labour force surveys 1990-2002, Insee.

TABLE 4 - Differences in means for demographic variables by 'twins-1' and 'twins-2'

For mothers living in a department where the preschooling rate is high

	Age	Age at first birth	Time span between the first 2 births	French natives	Age at the end of studies	Diploma
Twins-1	29.11 (0.73)	27.11 (0.73)	- -	0.96 (0.04)	19.63 (0.42)	0.22 (0.08)
Not	28.83 (0.05)	25.09 (0.05)	- -	0.96 (0.00)	19.50 (0.09)	0.22 (0.01)
Twins-1 Difference	0.281 (0.728)	2.019*** (0.728)	- -	0.003 (0.093)	0.126 (0.421)	-0.003 (0.081)
Twins-2	29.87 (0.71)	24.13 (0.70)	46.22 (4.76)	1.00 (0.00)	18.13 (0.46)	0.09 (0.06)
Not	30.21 (0.06)	23.74 (0.06)	40.55 (0.44)	0.95 (0.00)	18.73 (0.07)	0.18 (0.01)
Twins-2 Difference	-0.338 (0.715)	0.394 (0.698)	5.671 (4.781)	0.049*** (0.004)	-0.603 (0.468)	-0.095 (0.061)

Levels of significance: *: 10% **: 5% ***: 1%

SAMPLE: women with a spouse aged 21 to 35 living in a department where the schooling rate at two years old is high. In the first part of the table, the sample is restricted to mothers with at least one child and one of the two first children aged two. In the second part of the table, the sample is restricted to mothers with at least two children and one of the three first children aged two.

NOTE: standard errors are reported in parentheses.

SOURCE: labour force surveys 1990-2002, Insee.

For mothers living in a department where the preschooling rate is low

	Age	Age at first birth	Time span between the first 2 births	French natives	Age at the end of studies	Diploma
Twins-1	29.38 (0.34)	27.38 (0.34)	- -	0.92 (0.03)	19.68 (0.37)	0.28 (0.05)
Not	29.28 (0.04)	25.54 (0.04)	- -	0.87 (0.00)	19.89 (0.09)	0.29 (0.01)
Twins-1 Difference	0.103 (0.338)	1.841*** (0.338)	- -	0.046 (0.031)	-0.208 (0.382)	-0.010 (0.052)
Twins-2	31.12 (0.39)	25.24 (0.40)	46.86 (4.29)	0.92 (0.04)	21.08 (1.70)	0.38 (0.07)
Not	30.61 (0.04)	24.05 (0.05)	42.56 (0.39)	0.84 (0.01)	18.89 (0.08)	0.24 (0.01)
Twins-2 Difference	0.511 (0.389)	1.192*** (0.402)	4.304 (4.312)	0.076* (0.039)	2.192 (1.701)	0.140** (0.070)

Levels of significance: *: 10% **: 5% ***: 1%

SAMPLE: women with a spouse aged 21 to 35 living in a department where the schooling rate at two years old is low. In the first part of the table, the sample is restricted to mothers with at least one child and one of the two first children aged two. In the second part of the table, the sample is restricted to mothers with at least two children and one of the three first children aged two.

NOTE: standard errors are reported in parentheses.

SOURCE: labour force surveys 1990-2002, Insee.

TABLE 5 - *The effect of having more than one and more than two children on mothers' labour market participation*

Ordinary least square and Two-stage least square estimates

Estimation technique:	OLS	2SLS
First or second child is 2 years-old		
<i>Instrumen</i>	-	<i>Twins-1</i>
<i>t</i>		
More than 1 child * High rate	-0.188*** (0.016)	-0.590*** (0.183)
More than 1 child * Low rate	-0.142*** (0.014)	-0.349*** (0.109)
<i>N</i>	12,501	12,501
Second or third child is 2 years-old		
<i>Instrumen</i>	-	<i>Twins-2</i>
<i>t</i>		
More than 2 children * High rate	-0.304*** (0.021)	-0.251** (0.128)
More than 2 children * Low rate	-0.299*** (0.019)	-0.269*** (0.083)
<i>N</i>	7,726	7,726

Levels of significance: *: 10% **: 5% ***: 1%

SAMPLE: women with a spouse aged 21 to 35. In the first part of the table, the sample is restricted to mothers with at least one child and one of the two first children aged two. In the second part of the table, the sample is restricted to mothers with at least two children and one of the three first children aged two.

NOTE: standard errors (in parentheses) are adjusted for potential serial correlation. Other covariates are age, age at first birth, diploma, immigrant status, year fixed effects, department fixed effects, an indicator for the reform of the *Allocation parentale d'éducation*, and the sex of the first sibling. When the explanatory variable is the fact of having more than two children, additional covariates are age difference between the two first siblings (in months) and the sex of the second sibling. The main effect for the schooling rate at two-years-old is included in the regressions.

SOURCE: labour force surveys 1990-2002, Insee.

TABLE 6 - *The effect of having more than one and more than two children on mothers' labour supply according to their level of diploma*
Ordinary least square and Two-stage least square estimates

Subsamples:	High School graduates at the most		College graduates	
Estimation technique:	OLS	2SLS	OLS	2SLS
First or second child is 2 years-old				
<i>Instrument</i>	-	<i>Twins-1</i>	-	<i>Twins-1</i>
More than 1 child * High rate	-0.202*** (0.019)	-0.680*** (0.214)	-0.142*** (0.028)	-0.453*** (0.440)
More than 1 child * Low rate	-0.168*** (0.017)	-0.405*** (0.126)	-0.099*** (0.023)	-0.154*** (0.224)
<i>N</i>	9,19	9,19	3,311	3,311
Second or third child is 2 years-old				
<i>Instrument</i>	-	<i>Twins-2</i>	-	<i>Twins-2</i>
More than 2 children * High rate	-0.321*** (0.023)	-0.317** (0.136)	-0.212*** (0.054)	0.275*** (0.098)
More than 2 children * Low rate	-0.320*** (0.021)	-0.300*** (0.101)	-0.212*** (0.039)	-0.226* (0.131)
<i>N</i>	6,043	6,043	1,692	1,692

Levels of significance: * : 10% ** : 5% *** : 1%

SAMPLE: women with a spouse aged 21 to 35. In the first part of the table, the sample is restricted to mothers with at least one child and one of the two first children aged two. In the second part of the table, the sample is restricted to mothers with at least two children and one of the three first children aged two.

NOTE: standard errors (in parentheses) are adjusted for potential serial correlation. Other covariates are age, age at first birth, diploma, immigrant status, year fixed effects, department fixed effects, an indicator for the reform of the *Allocation parentale d'éducation*, and the sex of the first sibling. When the explanatory variable is the fact of having more than two children, additional covariates are age difference between the two first siblings (in months) and the sex of the second sibling. The main effect for the schooling rate at two-years-old is included in the regressions.

SOURCE: labour force surveys 1990-2002, Insee.

TABLE 7 - *The effect of having more than one and more than two children on fathers' labour market participation*

Ordinary least square and Two-stage least square estimates

Estimation technique:	OLS	2SLS
First or second child is 2 years-old		
<i>Instrumen</i> <i>t</i>	-	<i>Twins-1</i>
More than 1 child * High rate	-0.004 (0.004)	0.021*** (0.008)
More than 1 child * Low rate	0.004 (0.004)	0.026*** (0.006)
<i>N</i>	10,650	10,650
Second or third child is 2 years-old		
<i>Instrumen</i> <i>t</i>	-	<i>Twins-2</i>
More than 2 children * High rate	0.001 (0.005)	0.022*** (0.008)
More than 2 children * Low rate	-0.005 (0.005)	-0.073 (0.045)
<i>N</i>	5,935	5,935

Levels of significance: * : 10% ** : 5% *** : 1%

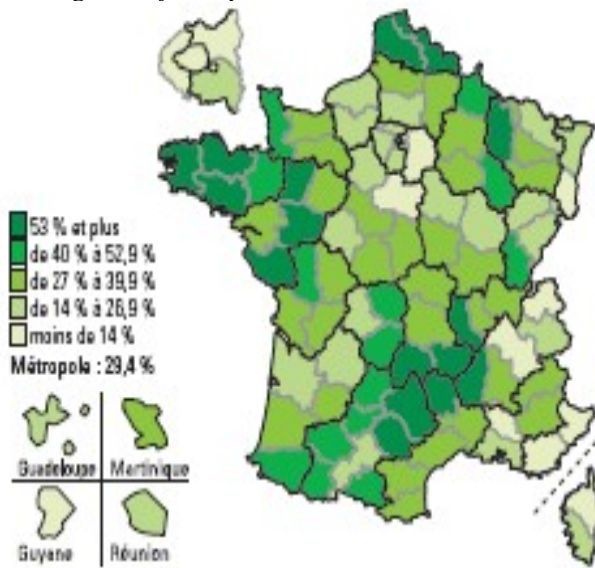
SAMPLE: men with a spouse aged 21 to 35. In the first part of the table, the sample is restricted to fathers with at least one child and one of the two first children aged two. In the second part of the table, the sample is restricted to fathers with at least two children and one of the three first children aged two.

NOTE: standard errors (in parentheses) are adjusted for potential serial correlation. Other covariates are age, age at first birth, diploma, immigrant status, year fixed effects, department fixed effects, an indicator for the reform of the *Allocation parentale d'éducation*, and the sex of the first sibling. When the explanatory variable is the fact of having more than two children, additional covariates are age difference between the two first siblings (in months) and the sex of the second sibling. The main effect for the schooling rate at two-years-old is included in the regressions.

SOURCE: labour force surveys 1990-2002, Insee.

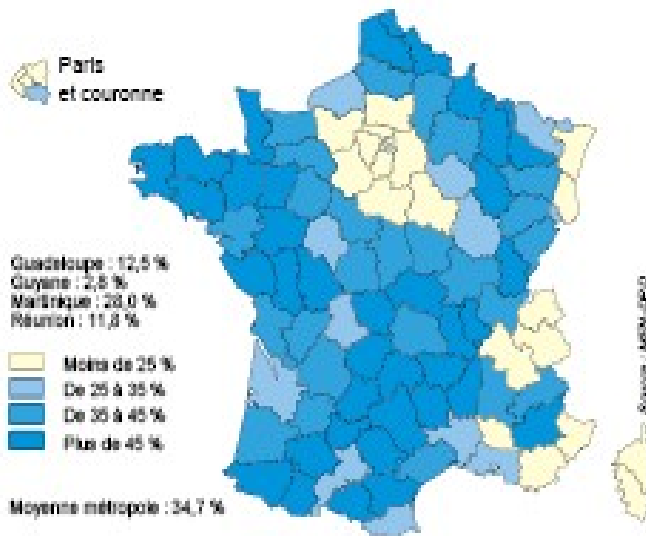
APPENDIX 1 - *Schooling rate of two-years-old in 2003 and 1997*

Schooling rate of two-years-old in 2003



SOURCE: Ministry of Education, <http://media.education.gouv.fr/file/06/7/3067.pdf>

Schooling rate of two-years-old in 1997



SOURCE: Ministry of Education, <ftp://trf.education.gouv.fr/pub/edutel/dpd/geosp4.pdf>

APPENDIX 2 - *Departments' classification according to schooling rates in 1997 and 2003*

Departments with high schooling rates for two-years-old:

Departments where the schooling rate was above or equal to 45% in 1997 and above or equal to 40% in 2003.

07 : Ardèche	48 : Lozère
08 : Ardennes	49 : Maine-et-Loire
09 : Ariège	50 : Manche
12 : Aveyron	52 : Haute-Marne
15 : Cantal	53 : Mayenne
19 : Corrèze	55 : Meuse
22 : Côtes-d'Armor	56 : Morbihan
23 : Creuse	59 : Nord
29 : Finistère	62 : Pas-de-Calais
32 : Gers	64 : Pyrénées-Atlantiques
35 : Ille-et-Vilaine	65 : Hautes-Pyrénées
39 : Jura	79 : Deux-Sèvres
42 : Loire	81 : Tarn
43 : Haute-Loire	82 : Tarn-et-Garonne
46 : Lot	85 : Vendée

Departments with low schooling rates for two-years-old:

Departments where the schooling rate was below 35% in 1997 and below 27% in 2003.

06 : Alpes-Maritimes	91 : Essonne
13 : Bouches-du-Rhône	92 : Hauts-de-Seine
2A : Corse-du-Sud	93 : Seine-Saint-Denis
2B : Haute-Corse	94 : Val-de-Marne
21 : Côte d'or	95 : Val-d'Oise
27 : Eure	
28 : Eure-et-Loir	
31 : Haute-Garonne	
33 : Gironde	
37 : Indre-et-Loire	
38 : Isère	
45 : Loiret	
57 : Moselle	
60 : Oise	
67 : Bas-Rhin	
68 : Haut-Rhin	
73 : Savoie	
74 : Haute-Savoie	
75 : Paris	
76 : Seine-Maritime	
77 : Seine-et-Marne	
78 : Yvelines	
83 : Var	
84 : Vaucluse	
87 : Haute-Vienne	
89 : Yonne	
90 : Territoire de Belfort	

