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Eric Maurin, Julie Moschion

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The Social Multiplier and Labour Market

Participation of Mothers

Eric MAURIN

Julie MOSCHION

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The Social Multiplier and Labour Market Participation of Mothers[1].

Eric Maurin[2] and Julie Moschion[3]

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Abstract: *In France as in the US, the participation of a mother in the labour market is influenced by the sex of her oldest siblings. Same-sex mothers tend to have more children and to work significantly less than the other mothers. In contrast, the sex of the oldest siblings does not have any perceptible influence on neighbourhood choices. There is no correlation between the sex of the siblings of a mother and the sex of the siblings of the other mothers living in the same close neighbourhood. Given these facts, the distribution of the sex of the siblings of the other mothers provides us with a plausible instrumental variable to identify the influence of other mothers' participation on a mother's participation in the labour market. Reduced-form analysis reveals that a mother's participation in the labour market is significantly affected by the sex of the oldest siblings of the other mothers living in the same neighbourhood. IV estimates suggest a strong impact of close neighbours' participation in the labour market on individual participation. We compare this result to estimates produced using the distribution of children's quarters of birth to generate instruments. Mothers whose children were born at the end of the year cannot send their children to pre-elementary school as early as the other mothers and participate less in the labour market. Interestingly enough, estimates using the distribution of quarters of birth in the neighbourhood as instruments are as strong as estimates using the sex-mix instruments.*

Résumé: *En France comme aux Etats-Unis, la participation d'une mère au marché du travail est influencée par le sexe de ses aînés. Les mères ayant des enfants de même sexe ont tendance à avoir plus d'enfants et à travailler moins à l'extérieur du foyer que les autres mères. Par contre, le sexe des aînés n'a pas d'impact substantiel sur les choix résidentiels. Il n'y a aucune corrélation entre le sexe des aînés d'une mère et celui des autres mères du voisinage proche. Ainsi, la distribution du sexe des aînés des voisines constitue une variable instrumentale plausible pour identifier l'influence de la participation des voisines sur la participation d'une mère au marché du travail. L'analyse en forme réduite révèle que la participation d'une mère au marché du travail est significativement moins forte quand ses voisines ont des aînés de même sexe. Les estimations par variable instrumentale suggèrent un impact important de la participation des voisines proches sur la participation individuelle. Nous comparons ensuite ce résultat aux estimations obtenues en utilisant la distribution des trimestres de naissance du deuxième enfant comme instrument. Les mères dont le deuxième enfant est né à la fin de l'année ne peuvent pas l'inscrire en maternelle aussi tôt que les autres et participent plutôt moins au marché du travail. Les deux instruments donnent des résultats très proches quant à l'influence de la participation des voisines sur la participation individuelle.*

Introduction

This paper provides an evaluation of the influence of close neighbours on a mother's decision to participate in the labour market. The question is whether the labour market behaviour of a mother is influenced by that of the other mothers living in the same close neighbourhood. To the best of our knowledge, there is still very little micro-economic evidence on the impact of neighbours' decisions on own labour market decision, even though social interactions has long been identified as a potential explanation for the puzzling variation in labour market outcomes across subgroups of workers, across time periods or across areas (see e.g. Alesina, Glaeser and Sacerdote, 2005). As it turns out, the identification of neighbours' influence on own labour market decisions raises deep difficulties.

One issue is that neighbourhoods measured in available dataset are often considerably larger than those which matters for outcomes (i.e., close neighbourhoods). Existing surveys on neighbourhood interactions suggest that we actually interact with a very little number of close neighbours only (2 or 3 maximum, see for example Héran, 1986). In contrast, studies on neighbours' influence typically proxy neighbourhood with census tracts that is, with very large groups of people (several thousands). The survey used in this paper enables us to overcome this problem. The sampling unit consists of small groups of about 20 to 30 adjacent houses. It provides us with a large sample of mothers with detailed information on the situation of all the other mothers living in their close neighbourhood. It makes it possible to analyse how mothers living in adjacent houses actually influence each other[4].

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[4] There exist a related literature which studies interactions among close neighbours, even though the focus is not on labour market participation (see e.g., Ioannides, 2002, Ioannides, 2003, Ionnadies and Zabel, 2003, Case and Katz, 1991). Goux and Maurin (2006) use the French Labour Force surveys to evaluate the effect of close neighbours on adolescents' educational outcomes.

Another major issue is to isolate variation in neighbours' labour market decisions which are exogenous to own decisions. Women living in the same neighbourhood tend to take similar participation decision. It is unclear whether it is because they influence each other or because neighbours typically share the same background and the same preferences. Ideally, we would like to analyse the behaviour of each mother depending on whether we facilitate or not (experimentally) her neighbours' participation in the labour market. Without such a controlled experiment, our strategy has to rely on the observation of a variable which affects the decision of each woman, but which has, as such, no effect on her neighbourhood choice nor on her neighbours' decisions. Specifically, the first identification strategy used in this paper is based on the observation of the sex of the oldest siblings of families.

As shown below, the sex of the two oldest siblings has a significant influence on the final number of children of a family and, consequently, on the participation in the labour market of the mother. These relations are observed in France as in other countries (for the US case see e.g. Angrist and Evans, 1998). In contrast, the sex of the two oldest children has no perceptible influence on neighbourhood choice. We do not observe any significant residential concentration of families having same-sex siblings. There is no significant correlation between the sex of the two oldest siblings of a woman and the sex of the two oldest siblings of her close neighbours. Given these facts, the observed shifts in the proportion of same-sex siblings' families across small neighbourhoods seem to be interpretable as quasi experimental random shocks to the proportion of close neighbours participating in the labour market. This is typically what is needed to isolate the influence of neighbours' participation in the labour market on an individual's participation. Do mothers living near families with different-sex siblings participate more in the labour market?

The survey used in this paper provides us with a positive answer to this question. A mother's probability to participate in the labour market is significantly higher when the other mothers in her close neighbourhood have different sex siblings than in the opposite case. This difference is observed regardless of whether her own eldest siblings are same-sex or not. Interestingly enough, the excess of participation in the labour market of a mother whose neighbours have different-sex siblings is approximately as big as the excess of participation of the neighbours themselves, due to their own children's sex. Assuming that the sex of neighbours' siblings influence a woman's participation only through its impact on their own participation, this result suggests a strong causal impact of neighbours' participation on a woman's participation. Using the sex of neighbours' oldest children as an instrumental variable, we obtain an estimation of the elasticity of a woman's participation with respect to her neighbours' participation of about 0.8. According to our estimations, a 10 percentage points increase in the participation rate of close neighbours increases a woman's probability of participation by about 8 percentage points.

We compare these findings to estimates produced using a completely different instrumental variable, i.e., the distribution of quarters of birth of the other children living in the neighbourhood. The participation of French mothers in the labour market is influenced not only by the sex of her siblings, but also by their quarter of birth. Children born at the end of the year cannot be sent at school as early as the other children and –because they are the less mature of their year-group- perform less well at the beginning of primary school. Within this context, mothers whose children were born at the end of the year are not less educated and do not have more children than the other mothers, but have nonetheless less incentive to work and more incentives to spend more time at home with their children. We find that they participate in the labour market significantly less than the other mothers. Within this context,

the variations in the proportion of children born at the end of the year across neighbourhood can be used exactly as the variation in the proportion of same-sex families to identify the endogenous social effect on mothers' labour market participation. Most interestingly, the quarter-of–birth instrument provides us with almost exactly the same evaluation of the endogenous social effect as the same-sex instrument (i.e., +0.8).

This paper belongs to the literature which tries to clarify the contribution of social interactions on women's increased involvement in modern economies. We are not aware of studies analysing the influence of close neighbours or friends on women's labour market decisions. Existing studies have mostly focused on social interactions between members of the same (broadly defined) family. For example, Raquel Fernandez, Alessandra Fogli and Claudia Olivetti (2004) make use of the difference across US states in the impact of WWII on mother's participation to show that a man who is brought up by a working mother is more likely to be married to a woman who works. The authors build on this result to argue that a determinant of the increase in women's involvement in the labour market has been the increasing number of men who, over time, grew up with a different family model. In a related paper, David Neumark and Andrew Postlewaite (1998) suggest that women's decisions to participate in the labour market are influenced by the decision of their sisters and by the social status of their sisters in law (see also Daniela Del Boca, Marilena Locatelli and Silvia Pasqua, 2000).

At a more general level, Claudia Goldin (2006) describes how each generation of women has been influenced by its immediate predecessors and how this process progressively altered the identity of women and shifted it from a family centred world to a more career oriented one. Claudia Goldin and Lawrence Katz (2002) show that the extremely large effect of the pill on

women's educational and occupational choices cannot be fully understood without taking social interactions into account. They argue that when a woman decides to delay marriage, her potential spouses remain in the marriage market longer and, consequently, remain available to other women. Hence, any exogenous shock delaying one woman's marriage (such as pill availability) diminishes the costs for other women to delay their own marriage and this creates social multiplier effects.

Our study can also be seen as a contribution to the literature which tries to understand the variation in labour market outcomes across areas or across subgroups of workers within areas. Alberto Alesina, Edward Glaeser and Bruce Sacerdote (2005) argue that part of the very strong difference in labour market outcomes between the US and Europe is due to positive complementarities across people in the enjoyment of leisure time. They provide several pieces of evidence which support the assumption that one person's leisure increases the returns to other people's leisure. One such piece of evidence is the strong convergence to a common two days week-end (i.e., Saturday and Sunday) despite the many disadvantages of crowding infrastructure usage during five days and living this infrastructure underutilized during two other days.

The paper is organised as follows. Section 2 provides a description of the data used in the paper. Section 3 shows the influence of the sex of the oldest siblings on the labour market participation of French mothers. Section 4 provides several pieces of evidence suggesting that the sex of the two oldest siblings does not influence neighbourhood choices. Section 5 estimates the (strong) influence on a mother's participation in the labour market of her neighbours' participation, using the sex of the two oldest siblings of the neighbours as an instrumental variable. Section 6 compares the estimates obtained with the quarter-of-birth instrument to those obtained with the same-mix instrument. Last section concludes.

II Data Description

The data used in this paper come from the 12 French Labour Force Surveys (LFS) conducted each year between 1990 and 2001. One interesting feature of the French LFS is that the basic sampling units actually consist of groups of about 20 adjacent households (aires). More specifically, a typical LFS consists of a representative sample of about 3,500 aires. Each year, within each aire, all the households are surveyed and, within each household, all the persons aged 15 or more are surveyed. The French statistical office (INSEE) has chosen this sampling strategy in order to reduce the travelling expenses of the investigators who are in charge of the survey.

For each respondent, we have standard information on his date of birth, sex, family situation, place of birth, education, labour market situation (unemployed, out of the labour force, employed). Also, for each household, we know the number, sex and birth date of the children living in the home.

We focus on the sample of mothers aged 21 to 35 years old, living in two-parents families and having at least two children at the time of the survey (N = 30,423). As Angrist and Evans (1998), we only have information on children still living with their parents: the LFS does not follow children outside the parental home. Focusing on mothers who are less than 35 prevents us from underestimating women's total number of children and from introducing errors on the rank of the children in the family. Women who are more than 35 possibly have of age children, who then have a higher probability of having left the parental home. Another interest of concentrating on 21-35 years old mothers is that our analysis of the links between the sex of the oldest siblings and the individual labour supply (first stage) is directly comparable with Angrist and Evans'(1998) analysis on american data.

For each woman in our sample, we observe on average four other women with two or more children living in the same small neighbourhood.

For each woman in our sample, the basic dependent variable will be a dummy indicating whether she participates in the labour market and the basic independent variables will be a dummy indicating whether her two eldest children are same-sex and a dummy indicating the quarter of birth of the second child. Also, for each woman, we construct several explanatory variables describing the average characteristics of the other families with two or more children living in her *aire*, namely the proportion of families in which the two eldest children are same sex, the proportion of families whose second child was born at the end of the year and the proportion of families where the mother participates in the labour market. Using the terminology of Manski (1993), the impact of other mothers' labour market participation on a mother's participation in the labour market corresponds the endogenous effect. Let us emphasize that, for each respondent, the different aire-level indicators are constructed using only the information on the individuals who do not belong to the family of the respondent.

As far as we know, there exist no studies on the effect of neighbours' influence on mothers' participation in the labour market. However, in the early 1980's, the French Statistical Office has carried out an interesting study on the intensity of social interactions within neighbourhoods. One of the clearest result is that we interact with a very little number of neighbours (2 or 3 on average). Also the relationships with neighbours are maintained mostly by women, and especially women with children. What emerges from this study is that mothers are actually much more exposed than others to the effect of neighbourhood interactions. The results of this study backs up our choice of focusing the analysis on women with children.

III Sex of oldest siblings, fertility and participation in the labour market

Table 1 analyses the participation in the labour market of the mothers in our sample according to the sex of the two oldest siblings. Among mothers with same sex siblings, the proportion of working women (0.588) is about 1.7 points lower than among mothers with different sex siblings (0.605). This difference is perceptible regardless of whether the first born is a boy or a girl, even if it is clearer (2.2 points) when it is a boy. Mothers' participation is not as well measured in the general census of the population as in the LFS. However, we have checked that the last census of the population (carried out in 1999) provides the same kind of result: mothers whose two oldest children are same-sex work significantly less than others, the difference being a little more than 1.1 point. On American data, Angrist and Evans (1998) put forward the same type of correlation but the magnitude is lower than in France.

There are several potential explanations to this relation between the sex of the oldest siblings and the participation of mother in the labour market (see e.g. Rosenzweig and Wolpin, 2000). Having same sex children may lower family spendings and make it less urgent for the mother to work (direct effect). The most plausible explanation is indirect, however: the sex of the oldest siblings influences the participation of mothers because it affects the final number of children in the family. As in the United States, French mothers with two girls or two boys are more inclined to have a third child than mothers who already have a boy and a girl (Goux and Maurin, 2005; Angrist and Evans, 1998). Table 1 confirms that the proportion of families with at least three children is 4 points higher in families where the oldest siblings are same-sex (31.5%) than in families where the oldest siblings are different sex (27.7%). Table 2 shows that these differences in the final number of children according to the sex of the oldest siblings cannot be explained by differences in the standard individual determinants of fertility. There is no significant difference in age, education level, nationality or in birth timing

between mothers according to the sex of their oldest siblings. What is at stake here really seems to be a preference of parents for mixed sex siblings and it is this preference that influences the participation decisions of mothers.

These results are consistent with the literature, and notably with the results of Angrist and Evans (1998): the sex of the two oldest siblings affects the final number of children, but also the participation of mothers in the labour market. The magnitude of the effect of the children's sex on fertility and participation is however different in their study on American data than in our French study, even though the method and the samples are defined the same way. The sex of the two oldest siblings have a lower impact on fertility in France than in the United States (about 6 points in the United States against 4 points here), but a higher impact on mothers' participation (-0.5 points in the US against -1.7 in France).

Assuming that the sex of the oldest siblings affects the participation of mothers only because it influences the final number of children, the ratio between the impact of the sex of the two oldest siblings on participation and its impact on fertility gives us an estimate of the causal effect of having a third child on the mothers' probability of participating in the labour market. This Wald estimate (about -0.4) suggests a higher elasticity in France than that estimated by Angrist and Evans (1998) in the US (about -0.1). The final number of children seems to have a more negative impact on mothers' participation in France than in the US. This difference has plausibly deep institutional causes, which analysis would exceed the scope of this paper. For now, it is enough remembering that the sex of the two oldest siblings influences the participation of French mothers more than American ones and that this is probably because the effect of the number of children on mothers' participation is more negative in France than in the US.

IV Sex of oldest siblings and neighbourhood choice

The sex of the two oldest siblings determines the decision of having a third child. But the birth of a third child often entails a change of neighbourhood. Hence, we cannot exclude that the sex of the two oldest siblings also determines (indirectly) the neighbourhood in which mothers bring up their children and take their labour market decisions.

If this was the case, the sex of the two oldest siblings of a family would be correlated with the sex of the two oldest siblings of other families in the neighbourhood. Interestingly enough, we observe no correlation of this type. Mothers with same-sex siblings do not have more neighbours with same-sex siblings or with three or more children than other mothers (see table 2, last columns). The data do not show any perceptible residential concentration of same-sex families. This result is consistent with the assumption that the sex of the oldest siblings is exogenous to neighbourhood selection.

It is possible to carry out an alternative test of this hypothesis by using the set of Labour Force Surveys as a pseudo-panel. Tables 3 and 4 focus on mothers with two children or more observed in surveys carried out between 1990 and 2001. We compare the sub-sample of mothers aged 24 to 29 between 1990 and 1995 with the sub-sample of mothers aged 30 to 35 between 1996 and 2001 (and who had at least two children born before 1996). We then have the same cohort six years apart. Table 3 retraces the evolution of the personal situation of the members of this cohort between the two sub-periods. Table 4 describes the evolution of their close neighbours, i.e. the characteristics of other mothers with at least two children living in the same neighbourhood. Regarding the individual situation of these mothers, some characteristics (as the diploma or the sex of the two oldest siblings) are fixed by definition. Also the evolution of the age of mothers across subsamples follows directly from the construction of these subsamples. We observe that mothers of the second sub-sample are

approximately six years older than the ones in the first sub-sample. Likewise, their two oldest children are about six years older. In fact, from the personal viewpoint, only two parameters change at this turning point of life: the participation in the labour market - which rises slightly[5] - and above all the number of children, since the proportion of mothers having at least three children is multiplied by 2.5 in six years (57% after age 30 against 23% before). As a matter of fact, it is around their thirties that most French mothers decide or not to have a third child. The issue is to understand whether this turning point of their mother's life goes also with significant changes in the quality of their neighbourhood. Table 4 brings some elements of answer. It details the average situation of *other* mothers living in the same close neighbourhood as the members of our cohort, when the later are 24-29 years old on the one hand, and 30-35 years old on the other hand. It reveals that after the age of thirty, the members of our cohort of mothers live in neighbourhoods in which other mothers are a little bit older and slightly less graduated than before thirty. But, there is no significant difference in the proportion of neighbours having three or more children or having same-sex oldest siblings. Again, this result may be interpreted as the fact that there is no neighbourhood specialised in the reception of families with three or more children. It does not seem possible to link the birth of a third child with moving into a neighbourhood better adapted to families with three children or more.

V The influence of neighbours' behaviour on own behaviour

The sex of the two oldest children of a woman is a determining factor of her participation in the labour market, plausibly because it determines her final number of children. On the other hand, the sex of the two oldest siblings of a family is not correlated with the size or with the

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[5] This increase may be interpreted as the combination of a direct positive effect of potential experience (time elapsed since school leaving date) and a negative indirect effect via the increase in family size.

sex of the two oldest siblings of the other families in the neighbourhood. The sex composition of the siblings does not seem to influence directly or indirectly the choice of the neighbourhood. Given these facts, the variation across neighbourhoods in the distribution of the two oldest siblings' sex provides us with a natural experiment, enabling us to identify the effect of neighbours' participation on own participation in the labour market.

To be more specific, assume that the participation decisions of the family i are given by:

$$(1) \qquad P_i = aVP_i + bS_i + u_i$$

where S_i indicates if the two oldest children are same sex, P_i indicates if the mother participates in the labour market and VP_i represents the proportion of i's neighbours who participate in the labour market. The variable u_i represents the set of individual and/or contextual factors (other than VP_i and S_i) that affects the participation decision of i. The parameter a represents the influence of the context that we want to identify, the parameter b represents the set of direct and indirect influences (particularly via the size of the sibship) of the sex of the two oldest siblings on the participation decisions. It corresponds to the reduced form of a very simple sequential model: given the sex of their two oldest children and the context they live in after the birth of the second child, parents decide or not to expand the family and/or to move. Once these decisions are taken, mothers decide or not to participate in the labour market according to the final size of their family and to the general context, notably to their neighbours decision[6].

Averaging equation (1) and reorganizing, the proportion VP_i can be written :

$$(2) \qquad VP_i = cVS_i + dS_i + v_i$$

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[6]It should be emphasized that this model does not exclude that the proportion of neighbours having 3 children or more may have influenced the decision of expanding the family. We do not isolate this particular factor of fertility as we are not able to identify the neighbourhood in which the decision to have a third child has been taken (notably for mothers who moved between the second and the third child). Our data do not enable us to analyse contextual effects on fertility. This is why we work directly on a reduced-form (2), without further specifying the mecanisms of fertility decisions.

where VS_i represents the proportion of neighbours having same sex children, where the new residual v_i is a linear combination of the u_j residuals affecting the decisions P_j of i's neighbours, and the parameter c is proportional to b and the parameter d is proportional to ab. Assuming that (1) b is not equal to zero (i.e., the sex of the two older children really affects – directly or indirectly- the participation in the labour market) and (2) S is not correlated with the neighbourhood characteristics that affects fertility decisions and the participation of the inhabitants (i.e., $E(S_i u_j) = 0$, there is no correlation between the sex of the two oldest children and the other factors affecting the neighbourhood participation), the proportion of same sex neighbours (VS_i) provides us with an instrumental variable which influences individual participation decisions (P) only because it influences the proportion of working women in the neighbourhood VP_i. The next section proposes an evaluation of a using this instrumental variable.

Results

The first column of Table 5 shows the results of the estimation of equation (2). This first stage regression confirms the existence of a significant negative effect of the proportion of neighbours having same-sex children on their own rate of labour market participation. The proportion of mothers participating in the labour market is 2.2 percentage points larger when their siblings are different-sex than when they are same-sex. The second column presents the regression of a woman's participation in the labour market on the sex of her two oldest children and the sex of the two oldest children of the other women living in the neighbourhood. Interestingly enough, this reduced form equation shows the existence of a significant effect of the proportion of same-sex neighbours on a woman's participation in the labour market. The size of this effect is as large as that of the direct effect of her children's

sex on her own participation. A mother's probability to participate in the labour market is 1.8 percent points larger when the other mothers have different-sex rather than same-sex siblings. The sex composition of the siblings of neighbours has almost the same effect on a women's participation than on the participation of her neighbours themselves. This result suggests a strong elasticity between a woman's participation and that of her neighbours. As a matter of fact, the elasticity estimated by the IV method is 0.8 (column 4). A 10 percent points increase in the proportion of neighbours participating in the labour market generates a 8 percent points increase in the probability of participation of a woman.

Table 6 provides an alternative evaluation using a characterization of the sex composition of the siblings by a complete set of three dummies (boy-girl, girl-boy, girl-girl, and boy-boy being the ref.) rather than by a single same-sex dummy variable. The first-stage *F*-statistics shows that the proportions boy-girl, girl-boy and girl-girl in the neighbourhood represents a set of relatively powerful instruments (*P>.01*). The IV estimates are very similar to those obtained in Table 5, but better estimated. The over-identifying restrictions are not rejected at standard level. Comfortingly, the sex composition of the siblings has the same impact on own participation in the labour market as on neighbours' participation. Families with two boys participate relatively less than other families. Also, they increase the participation of their neighbours families relatively less than other families. In contrast, families with a boy and a girl participate relatively more and increase the participation of their neighbours relatively more than the other families.

The IV estimate is higher than the OLS estimate (0.2), even if strictly speaking the difference between the two estimates is not significant. It is something of a puzzle, since endogenous neighbourhood selection is typically likely to bias OLS coefficient upward[7]. One possible

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[7] Interestingly enough, comparing experimental and non-experimental estimates, Liebman et al. (2004) do not find evidence of upward bias from non-random sorting of households across neighbourhoods, as would occur

explanation is that we measure P with an error that affects mechanically VP, the explanatory variable of interest. This results in an attenuation bias on the OLS estimate. The bias is all the more significant that the variance of the errors is large. If this interpretation is correct, the difference between the OLS and the IV estimate should decrease when focusing on neighbourhoods with more mothers (i.e., a smaller variance in the error affecting the measurement of VP). This is actually what we observe: the OLS estimate is about three times as large (about 0.5) when we restrict the sample to neighbourhoods with at least 7 neighbours, whereas the IV estimate is almost unchanged (see Table 7).

VI An evaluation using children's quarter of birth as an instrument

This section compares the estimates produced using the sex-mix instrument to estimates obtained with the distribution of quarters of birth of the other children in the neighbourhood. Specifically, our second identifying strategy builds on the fact that French mothers' whose children were born at the end of the year participate less in the labour market than other mothers, due to specific feature of the French pre-elementary and elementary schools.

Children born at the end of the year cannot attend school as early as the other children, because of the specific enrolment rules of French pre-elementary schools[8]. Also, pupils born at the end of the year are the youngest of their year-group and, as a consequence, perform less

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under assumption that persons with good unobservables have also good outcomes and live in good neighbourhood. A similar finding is reported by Goux and Maurin (2006) in their analysis of neighbourhood effects on early performance at school.

[8] In France, the majority of children begin pre-elementary public school in september of the year of their third birthday. A significant fraction (about 30%) are even allowed to begin school one year earlier, in september of the year of their second birthday. School heads are asked to give priority to children whose second birthday is before september, however (i.e., to children who are actually 2 years old in september). As a consequence, the proportion of early starters is much weaker for children born after september (18%) than for children born before september (40%). Parents whose children were born at the end of the year have less access to this specific form of free child-care and more incentives to stay at home to take care of their children than other parents.

well at the beginning of primary school[9]. Within this framework, mothers whose children were born at the end of the year have more incentive to stay at home with their children and less incentive to work.

When we focus on the sample of mothers with two or more children, our data confirm that those whose second child was born at the end of the year participate significantly less in the labour market than the other mothers (Table 8, first column). Also Table 8 shows that this participation gap cannot be explained by variation in births' seasonality across mothers' with different background. Mothers whose second child was born during the last quarter of the year are neither more educated, nor older, nor more often non-French than the other mothers. They do not have more children either. Also, the LFS data do not reveal any specific residential concentration of families whose second children were born at the end of the year. Table 4 confirms that the proportion of neighbours whose children were born at the end of the year does not vary across a mother's life cycle. Given these facts, the variation across neighbourhoods in the proportion of mothers whose second child was born at the end of the year provides us with a plausible alternative instrument for identifying the impact on a mother's labour market participation of the participation of the other mothers living in the same neighbourhood.

The first-stage regression confirms that the proportion of mothers in the neighbourhood who participate in the labour market is negatively correlated with the proportion of mothers whose second-born children were born at the end of the year (Table 9, column 1). Most interestingly, the reduced-form regression reveals that a mother's probability of participating in the labour market is significantly reduced when the children of the other mothers were born at the end rather than at the beginning of the year. The last column shows the result of a regression of a

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[9] The national evaluations conducted each year at entry into third grade show an average difference of about 1/2 of a standard deviation between the scores of children born in January (the most mature of their year-group) and those of children born in December (the least mature).

mother's participation in the labour market on the participation of the other mothers, using the quarter of birth of the children of the other mothers as an instrumental variable. The IV estimate is as large as the estimate obtained with the sex-mix instrument.

Table 10 shows the results of first-stage and second-stage regressions when we use jointly the same-sex and quarter-of-birth instruments to identify the endogenous social effects. The first-stage *F*-statistics shows that the proportions boy-girl, girl-boy and girl-girl in the neighbourhood represents a set of powerful instruments. Also over-identification restrictions are not rejected. We find almost exactly the same IV estimates as when the instruments are used separately, but they are estimated much more precisely.

VII Conclusion

A mother's decision to participate in the labour market is correlated with those of the other mothers living in the same neighbourhood. This paper studies the extent to which this is causal. An identification problem exists because mothers with similar characteristics are often observed living in close proximity. Another difficulty is that neighbourhoods measured in available datasets are typically larger than those which actually matter for outcome (i.e., close neighbourhoods). The French Labour Force Surveys enable us to overcome this problem and to consider the effect of close neighbours on own outcomes because of the nature of data collection: the basic sampling units consist of groups (*aires*) of 20 to 30 adjacent households. Our identifying strategy uses instrumental variables. In France, the sex of the two oldest siblings has a significant impact on the decision of mothers to participate in the labour market. The effect is actually stronger than in the US. In contrast, the sex of the two oldest siblings does not have any perceptible effect on neighbourhood choice. The data do not reveal any significant variation in the basic characteristics of neighbours (family size, sex of siblings…)

across same-sex and different-sex mothers. Given these facts, the distribution of the sex of the oldest siblings of the neighbours provides us with a plausible instrument to identify the effect of neighbours' participation in the labour market on own participation. Interestingly enough, the reduced-form analysis shows a significant influence of the sex of the neighbours' siblings on own participation and the IV estimate suggests a very strong elasticity of own participation to neighbours participation. We compare this result to estimates produced using the distribution of children's quarters of birth to generate instruments. Mothers whose children were born during the fourth quarter of the year cannot send their children to pre-elementary school as early as the other mothers and participate less in the labour market. Interestingly enough, estimates using the distribution of quarters of birth in the neighbourhood as instruments are as strong as estimates using the sex-mix instrument. Understanding variation in women's labour supply across areas and over time is a very difficult task. This paper suggests that one plausible explanation is the existence of a strong social multiplier, where the utility of not working is strongly linked to the proportion of close neighbours who do not work.

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Table 1 : Impact of the sex of the two oldest children on mothers' fertility and participation

			Sex of the two oldest children				
	2 boys	2 girls	boy, girl	girl, boy	Same sex (1)	Different sex (2)	Difference [6] (1)-(2)
Proportion in population	.262	.242	.250	.246	.504	.496	.008
Proportion 3 children or more	.315 (.005)	.316 (.005)	.273 (.005)	.282 (.005)	.315 (.004)	.277 (.004)	.038 (.005)
Proportion participating in labor market	.585 (.006)	.590 (.006)	.610 (.006)	.601 (.006)	.588 (.004)	.605 (.004)	-.017 (.006)

Source : LFS 1990-2002.
Sample : Women aged 21-35 years old, two children or more.

Table 2 : Demographic differences between mothers according to the sex of their two eldest children .

	Individual characteristics of the mother					Characteristics of the other mothers in the neighbourhood	
	Age	Age at first birth	[French=1]	Nb. Children	[High school grad.=1]	% with 3 children or more	% neighbours with same sex children
Same sex (MS)	31.03 (.02)	22.95 (.03)	.910 (.002)	2.42 (.006)	.711 (.004)	.296 (.002)	.504 (.003)
Different sex (SD)	31.03 (.02)	22.96 (.03)	.914 (.002)	2.37 (.006)	.711 (.004)	.297 (.002)	.504 (.003)
Difference MS-SD	.0030 (.036)	-.013 (.040)	-.004 (.003)	.058* (.008)	-.0012 (.0052)	-.001 (.003)	-.0007 (.0035)

Source : LFS 1990-2002.
Sample : Women aged 21-35 years old, with two children or more.

Table 3 : Evolution of mothers' demographic characteristics according to their age : a pseudo-panel analysis of the cohort observed in 1990-1995 and 1996-2001.

	Average of individual characteristics		Difference
	1990-1995 (24-29 years old)	1996-2001 (30-35 years old)	
Age	27.30 (.02)	33.29 (.02)	5.99 * (.03)
Number of children	2.28 (.008)	2.81 (.013)	.52 * (.01)
Proportion > 2 children	.23 (.006)	.57 (.007)	.34 * (.009)
Age at first birth	21.38 (.038)	21.50 (.038)	.12* (.05)
Sex 1st child	.483 (.007)	.484 (.007)	.001 (.010)
Sex 2nd child	.494 (.007)	.488 (.007)	-.006 (.010)
Age 1st child	5.93 (.038)	11.79 (.038)	5.86* (.05)
Age 2nd child	3.05 (.037)	8.93 (.037)	5.88* (.05)
[Participation labour market=1]	.544 (.007)	.619 (.007)	.075* (.010)
[High-school grad.=1]	.797 (.006)	.800 (.006)	.003 (.008)
Same sex	.502 (.007)	.504 (.007)	.002 (.010)
Second child born during fourth quarter	.247 (.006)	.256 (.006)	.009 (.009)

Source : LFS 1990-2002. Sample : Women observed in 1990-1995 when aged 24-29 years old and with 2 children or more. The table compares their average characteristics in 1990-1995 with their average characteristics six years later in 1996-2001. Reading: When we follow over time the cohort of mothers observed in the LFS 1990-1995 at the age of 24-29, we find that the proportion with three children or more is 22.9% in 1990-1995 and 55.6% six years later in 1996-2001.

Table 4 : Evolution of the demographic characteristics of the other mothers living in the neighbourhood according to a mother's age: a pseudo-panel analysis of the cohorts observed in 1990-1995 and 1996-2001.

Characteristics of other mothers in the neighbourhood	Average of mean neighbour's characteristics		Difference
	1990-1995 (24-29 years old)	1996-2001 (30-35 years old)	
Age	30.65 (.03)	31.33 (0.03)	.68 (.04)
Nb children	2.43 (.007)	2.42 (.007)	-.015 (.010)
Proportion > 2 children	.32 (.004)	.31 (.005)	-.002 (.006)
Age at 1st birth	22.43 (.030)	23.13 (.035)	.704 (.047)
Sex 1st child	.485 (.004)	.483 (.005)	-.002 (.006)
Sex 2nd child	.493 (.004)	.489 (.005)	-.004 (.006)
Age 1st child	8.22 (.033)	8.20 (.037)	-.02 (.05)
Age 2nd child	5.064 (.032)	5.024 (0.036)	-.039 (.049)
[Participation labour market=1]	.585 (.004)	.579 (.005)	-.006 (.007)
[High-school grad.=1]	.771 (.004)	.711 (0.005)	-.061 (.006)
Same sex	.510 (.004)	.504 (.004)	-.006 (.006)
Second child born during fourth quarter	.249 (.004)	.253 (.004)	.003 (.006)

Source : LFS 1990-2002. Sample : Woman aged 21-35 years old, 2 children or more.
Reading: When we follow over time the cohort of mothers observed in the LFS 1990-1995 at the age of 24-29, we find that the average proportion of neighbours with same-sex eldest children is 51.2% in 1990-1995 and 50.3% six years later in 1996-2001.

Table 5 : The Endogenous Effect on Mothers' Labour Market Participation : an Evaluation using the Proportion of Same-Sex Families in the Neighbourhood as an Instrumental Variable.

Independent variables		Dependent variable : [Participation Lab. Market=1]		
	First stage (1)	Reduced form	OLS	IV
Characteristics of other mothers in the neighbourhood				
% [Participation L.M. =1]	-	-	.19	.80
			(.01)	(.44)
% [Same Sex=1]	-.022	-.018	-	-
	(.006)	(.009)		
Individual Characteristics				
[Same Sex=1]	-.07	-.018	-.016	-.012
	(.004)	(.006)	(.006)	(.007)
Nb of Obs.	30423	30423	30423	30423

Source : LFS, t=1991 to 2002, Insee. Sample : Women aged 21-35 years old, with two children or more.

Note (1): The dependent variable of the first-stage regression is the proportion of other mothers in the neighbourhood participating in the labour market. The dependent variable of the other regression is the individual participation in the labour market.

Table 6 : The Endogenous Effect on Mothers' Labour Market Participation : an Evaluation using the Sex Composition of Other Families in the Neighbourhood as an Instrument.

Independent variables	Dependent variable : [Participation Lab. Market=1]			
	First stage (1)	Reduced form	OLS	IV
Characteristics of other mothers in the neighbourhood				
% [Participation L.M. =1]	-	-	.19 (.01)	.93 (.42)
% [boy-girl=1]	.029 (.008)	.030 (.013)	-	-
% [girl-boy=1]	.024 (.008)	.027 (.013)	-	-
% [girl-girl=1]	.010 (.008)	.022 (.013)	-	-
% [boy-boy=1]	ref	ref	-	-
Individual Characteristics				
[boy-girl=1]	.011 (.005)	.025 (.008)	.023 (.008)	.015 (.010)
[girl-boy=1]	.010 (.005)	.015 (.008)	.013 (.008)	.006 (.010)
[girl-girl=1]	.008 (.005)	.005 (.008)	.003 (.008)	-.003 (.009)
[boy-boy=1]	ref	ref	ref	ref
First-stage *F*-statitistics	5.1			
(Pr>F)	*(.0016)*			
Over-id. Test				.35
(Pr>F)				*(.50)*
Nb of Obs.	30423	30423	30423	30423

Source : LFS, t=1991 to 2002, Insee. Sample : Women aged 21-35 years old, with two children or more. Note (1): The dependent variable of the first-stage regression is the proportion of other mothers in the neighbourhood participating in the labour market. The dependent variable of the other regression is the individual participation in the labour market.

Table 7: Variation in OLS and IV estimates of the endogenous effect across sub-samples

	Full Sample		Sub-Sample with nb of neighbours>4		Sub-sample with nb of neighbours >6	
	OLS	IV	OLS	IV	OLS	IV
Endogenous Effect	.19 (.02)	.80 (.44)	.37 (.02)	.67 (.31)	.50 (.02)	.88 (.47)
Nb of Obs.	30423		15855		8936	

Source : LFS, t=1991 to 2002, Insee. Women aged 21-35 years old, with two children or more.

Table 8 : Demographic differences between mothers according to the quarter of birth of their second child .

	Individual characteristics of the mother						Characteristics of the other mothers in the neighbourhood	
	Particip. in Lab. Market.	Age	Age at first birth	[French=1]	Nb Child.	[High-school grad.=1]	% with 3 children or more	% second child born in Q1
Born fourth quarter (Q1)	.582 (.0057)	30.97 (.036)	23.01 (.039)	.912 (.003)	2.39 (.008)	.711 (.005)	.503 (.004)	.258 (.003)
Born before fourth quarter (Q0)	.601 (.032)	31.05 (.021)	22.94 (.023)	.912 (.002)	2.39 (.004)	.711 (.003)	.505 (.002)	.248 (.002)
Diff. (Q1-Q0)	-.019* (.006)	-.078 (.041)	.069 (.046)	.0003 (.0037)	-.0036 (.0095)	-.003 (.006)	-.0021 (.0041)	.010 (.004)

Source : LFS 1990-2002. Sample : Women aged 21-35 years old, with two children or more.

Table 9 : The Endogenous Effect on Mothers' Labour Market Participation : an Evaluation using the Proportion of Children Born at the End of the Year as Instrument

Independent variables	Dependent variable : [Participation Lab. Market=1]			
	First stage	Reduced form	OLS	IV
Characteristics of other mothers in the neighbourhood				
% [Participation L.M. =1]		-	.19 (.01)	.79 (.36)
% [Second child born during fourth quarter=1]	-.030 (.007)	-.024 (.010)		-
Individual Characteristics				-
[Second child born during fourth quarter=1]	-.009 (.004)	-.018 (.006)	-.017 (.006)	-.011 (.008)
Nb of Obs.	30423	30423	30423	30423

Source : LFS, t=1991 to 2002, Insee. Sample : Women aged 21-35 years old, with two children or more, living in areas with less than 100,000 hab.

Note (1): The dependent variable of the first-stage regression is the proportion of other mothers in the neighbourhood participating in the labour market. The dependent variable of the other regression is the individual participation in the labour market.

Table 10 : The Endogenous Effect on Mothers' Labour Market Participation : an Evaluation using Jointly Quarter-of-Birth and Sex-mix Instruments.

Independent variables	Dependent variable : [Participation Lab. Market=1]			
	First stage	Reduced form	OLS	IV
Characteristics of other mothers in the neighbourhood				
% [Participation L.M. =1]		-	.19 (.01)	.80 (.28)
% [Same Sex=1]	-.022 (.006)	-.018 (.009)	-	-
% [Second child born during fourth quarter=1]	-.030 (.007)	-.024 (.010)	-	-
Individual Characteristics				
[Same Sex=1]	-.007 (.004)	-.018 (.006)	-.016 (.006)	-.012 (.006)
[Second child born during fourth quarter=1]	-.009 (.004)	-.018 (.006)	-.017 (.006)	-.011 (.007)
First-stage *F*-statistics	16.7			
(*Pr>F*)	(*<.0001*)			
Over-identification Test	-	-	-	.00
(*Pr>F*)				(*.99*)
Nb of Obs.	30423	30423	30423	30423

Source : LFS, t=1991 to 2002, Insee. Women aged 21-35 years old, with two children or more, living in urban area with more than 100,000 hab.

Note (1): The dependent variable of the first-stage regression is the proportion of other mothers in the neighbourhood participating in the labour market. The dependent variable of the other regression is the individual participation in the labour market.

Appendix

Consider a neighbourhood of size n and let P represent the $(n,1)$ vector of dummies characterizing mothers' participation, S the $(n,1)$ vector of dummies characterizing oldest siblings' sex, and U the vectors of residuals. Equation (1) can be rewritten,

(1) $MP=bS+U$

where M is a (n,n) matrix such that

$m(i,i)=1$ and $m(i,j)=m=-a/(n-1)$ for i different from j.

It is easy to check that $Q=M^{-1}$ is a (n,n) matrix such that

$q(i,i)=q_1=(1+(n-2)m)/(1+(n-2m-(n-1)m^2)$,

and $q(i,j)= q_2 =-m/(1+(n-2m-(n-1)m^2)$ for i different from j.

Hence, Equation (1) can be rewritten,

(1bis) $P=bQS+QU$

which yields,

(2) $VP_i = cVS_i +dS_i + v_i$

where $c= q_1b$ whereas $d=(n-1)bq_2=ab/(1+(n-2m-(n-1)m^2)$

and $v_i=q_1\ v_i -a(v_1 +\ldots+v_{i-1} +v_{i+1} +\ldots+v_n)/(1+(n-2m-(n-1)m^2)$