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THE EFFECT OF MATERNAL EDUCATION ON CHILDREN'S

ACADEMIC PERFORMANCE

by

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Title: <u>The effect of maternal education on children's academic performance</u>

This paper studies the impact of maternal education on children's academic outcomes, particularly their grade repetition. Using time fixed effect analyses with data from the French Labor Force Survey (LFS); we find a negative and significant association between maternal education and children's grade repetition. On average, one more year of maternal education decreases the probability of children's grade repetition by 0.8 percentage points. We show that our results are robust by including a set of possible control variables. Plausible mechanisms that explain the maternal education-child academic outcome association provide more convincing evidence that the relationship between maternal education and children's grade repetition is negative.

CONTENT

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CHAPTER 1

INTRODUCTION

Education contributes to the development of human capital and is related to individual well-being and better living conditions (Ermisch, 2003, Battle & Lewis, 2002). Specifically, women's education is frequently seen as an efficient policy for the development of human resources in countries with low-income and for the improvement and benefit of their children's education. It is also widely recognized that maternal education is an important factor in influencing the academic performance of children. Since policymakers are using mother's education as a factor to ameliorate children's educational outcomes, it is important to look at the conditions under which maternal education does and does not improve children's learning. Possible mediators of the impact of maternal education involve children and mother's characteristics, and the type of educational curriculum. However, one major mediator for that positive effect may be the type of education acquired by mothers. So it is important for policy makers to understand and encourage which of the many types of mother's education such as basic skills, professional degrees…may benefit their children (Magnuson, 2002). Educated mothers encourage their children in their study and are their source of power. Their education is a necessity since they can transfer knowledge and concepts to their children in a better way than any other person, they can assist them in their homework and guide them for a better future (Awan, 2015).

Higher levels of maternal education are positively correlated with different children's educational outcomes throughout development. Prior to the school entry of children, higher maternal education has been related to more promoted language production (Dollaghan et al., 1999) and achievement in cognitive tests (Magnuson et al., 2009). Throughout primary, middle and high school, evidence suggests strong relationships between maternal education and children's academic attainment, comprising grade-points averages and SAT scores for students (Sirin, 2005). In advanced development stage later on, adolescents whose mothers attain higher levels of education are more likely to finish high school and enter college (Choi et al., 2008). Haveman and Wolfe (1995) find that maternal education was one of the most appropriate indicators of children's achievement compared with other variables such as parent's income. It has been related to many children's educational outcomes such as cognitive tasks as early as three months of age (Roe et al., 1988), school readiness (Christian et al., 1996; Seefeldt et al.,1999), school grades (Smith, 1989), academic achievement tests (Alexander et al., 1994; Alwin et al., 1984; Davis-Kean et al., 2001) and academic attainment (Ensminger et al., 1992). Besides, mother's education is associated with children's grade repetition and special education placement which in their turn suggest bad problems like low grades or scores on tests in elementary school (Dauber, Alexander, & Entwisle, 1993). Accordingly, mothers with low level of education are more likely to have children in special education at an age of 10 years because of learning inability. Also mothers having less than a high school certificate tend to have children as twice as likely to be placed in special education as mothers with a high school diploma (Holloman et al., 1998). Moreover, Byrd and Weitzman (1994) present that children whose mothers did not finish high school are 1.4 times more likely

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to held back kindergarten or grade one compared to children whose mothers graduated from high school. On another side, mother's educational attainment can be theorized as one of the key factor for children's well-being and academic development, because it can predict factors such as occupational status and wages that can affect the future economic well-being of children. For example, parents with more educational attainment can benefit their children in an indirect way through their income since more educated parents receive more wages in the labor market than less educated parents (Duncan et al., 1997).

This article attempts to improve our understanding of the effect of maternal education on children's educational outcomes, particularly their grade repetition. Also it presents some plausible mechanisms that can mediate their relationship. Our main analysis is based on a sample of mothers with their children at age 15 taken from the French Labor Force Survey (LFS) from the years 1990 to 1998. For identification, we use a time fixed effect model that control for all unobserved factors varying across time (years of survey). Results show a negative association between mothers'education and their children's grade retention. On average, the probability of children's grade repetition decreases by 0.8 percentage points as a result of a one year increase in their mother's years of education. We further find that children of uneducated mothers are more likely to repeat a grade compared to children of mothers holding less than a high school degree. Furthermore, the likelihood of repeating a grade for children whose mothers hold a high school or postsecondary degree decreases relative to children whose mothers hold less than a high school degree.

The rest of this paper is structured as follows. Chapter 2 presents the literature review. Chapter 3 provides information on the French educational system. Chapter 4 and 5 describe the data and identification strategy respectively. In chapter 6, we present the empirical results. We discuss our findings and the underlying mechanisms in chapter 7. Finally, we conclude in chapter 8.

CHAPTER 2

LITERATURE REVIEW

2.1 Effects of parental education on children's educational outcomes

One strand of the literature shows that parental education is an important factor for a better performance of their children. The more parents are educated; the better is the educational attainment of their children. Monique de Haan (2011) in her study uses a nonparametric bound analysis to identify intergenerational schooling effects. The tightest bounds present that an increase in parent's schooling to a college degree has a significant positive effect on their child's schooling. Abu Bakar et al. (2017) indicate that the effect of parent's education on their children's academic performance in secondary schools in Kuala Terengannu is positive and about 10%. So children of highly educated parents perform better than those of less educated parents. These children further show low levels of absenteeism in schools. Kloosterman et al. (2009) use data on five cohorts of Dutch students who registered in secondary education. They find that the performance score and the likelihood of the transition to higher secondary education of children with highly educated parents are higher on average than that of children with middle and low educated parents. Some other researchers focus only on the role of mothers in transmitting education to their children and consider their education an essential input in promoting the educational outcomes of their offspring. Mother's education has been associated with children's academic attainment. Haveman and Wolfe (1995) find that maternal education was one of the most appropriate

indicators of children's achievement compared with other variables such as parent's income. It has been related to many children's educational outcomes such as cognitive tasks as early as three months of age, school readiness, school grades, academic achievement tests and academic attainment. Behrman and Roscnzweig (2000) find that the educational attainment of children increases by 0.12 years for an additional year of maternal education.

Awan et al. (2015) present that the academic attainment of children increases with the increase in mother's educational level and the correlation coefficient between these two variables is high(0.91).In addition to having lower level of truancy, mental and physical illness and they perform well in their courses and extra activities. Another study by Durmazlak et al. (1998) uses the Denver II developmental screening test to study the effect of sex and maternal education on the development of a healthy Turkish child. They find that maternal education has a positive effect on the 37 to 72 month-old group and it is more crucial to the child's development particularly in countries that lack preschool education. Children with highly educated mothers are more likely to develop earlier than children of less educated mothers especially in language and fine motor areas. Sabates et al. (2011) highlight the importance of maternal prior learning more than maternal adult learning in explaining the academic attainment of children. They suggest that children of mothers who learned during adulthood, have on average two months of progress in mathematics KS3 scores and three months of progress in English scores, compared with those whose mothers did not engage in learning. However, with the inclusion of maternal prior education as a control variable, the association between maternal adult learning and children's attainment becomes statistically insignificant except for unaccredited and informal learning. Marks (2007) aims to compare the effect

of father's and mother's education and occupation on student outcomes in literacy and numeracy. He finds that in many countries the effect of mother's education is greater than that of fathers on children's attainment and it has increased over time while the effect of father's occupation is greater than that for mothers on student performance.

2.2   Why parental educations affect children's educational outcomes?

Another strand of the literature presents the relationship between parental education and children outcomes in an indirect way, in a sense that parent's education affects their children's performance through some parent's attitudes and behaviors towards them and through the structure of the home environment. The educational attainment of parents can have an effect on children's educational outcomes because parents set academic expectations of their children's attainment (Parsons et al., 1982). Parents with higher education are more likely to directly define higher level of education, motivate their children to better perform in school and have higher expectations for their children's attainment than parents with less education (Alexander et al., 1994; Cohen, 1989; Davis-Kean & Schnabel, 2001; Grolnick & Slowiaczek, 1994; Lee & Croninger, 1994). Davis-Kean(2005) using data from a national, cross-sectional study of children, finds that the impact of parent's education on their children's academic performance can be indirectly explained by parent's educational expectations of how much schooling their children will complete and parent's home behaviors(reading, playing, affection…) but it differs by racial groups. Also Acharya and Joshi (2009) find that the significant association between parent's educational level and the achievement motivation of the adolescents in academic area is mediated by parent's beliefs and attitudes. And that was seen more among adolescents belonging to post

graduate and graduate parents than to intermediate and high school educated parents. Moreover, more involved parents show more interest in their children studies and school meetings, in addition to encouraging them and valuing their good performance. Specifically, highly educated mothers are more likely to involve in social networks and acquire information, knowledge and skills relevant to the academic success of their children which in their turn tend to have better academic and cognitive outcome (Akbar Ali Shah et al., 2014; Harding et al., 2015). The educational levels of parents are related to some aspects of the home environment like the number of books at home, learning games played with parents, and the discussion of current events (Kohl et al., 2000). And many studies have showed that the effect of parental education on their children's reading achievement is mediated by home learning activities (Davis-Kean & Schnabel, 2001; Smith et al., 1997). Magnuson et al. (2009) find that an increase in mother's schooling having initially low level of education is positively associated with children's expression and acquisition of language skills. And 23% of this relationship is mediated by changes in the quality of home environments. And a study by Shoukat et al. show that children of qualified parents score high CGPA and are more intelligent. They state that parent's involvement and home environment have an impact on children's performance and studies. On the other hand, less qualified parents also have an effect on their children's education by supporting them, providing them with the essentials to study and having high expectations from them.

2.3 Causal effect of parental education using compulsory school reforms

Some recent studies by Oreopoulos et al. (2006) ,Chevalier (2004) and Piopiunik (2014) try to examine the causal effect of parent's education on their children academic

performance by taking advantage of compulsory school. Oreopoulos et al. (2006) in their study use changes in compulsory schooling laws to study the effect of parental education on children's grade-for-age using the 1960, 1970, and 1980 U.S. censuses. OLS results show a positive association between parental education and their children education. And IV estimates present that an increase in parental education by one year reduces the probability that a child repeats a grade in school by between 2 and 4 percentage points. Chevalier (2004) exploits a compulsory school reform in England and Wales in 1957 which increases the minimum school leaving age from 15 to 16. He finds that the effect of parent's education on their children's academic performance is positive and statistically different from zero only for biological children, while this effect is zero or negative when taking step parents to analyze. So there are positive effects for both mothers and father's education on their biological children's school attainment. Piopiunik (2014), by taking advantage of a compulsory schooling reform in Germany, finds that an extra year of education for mothers has a strong impact on their sons and parents with more education appreciate and value the educational accomplishment of their children. Maurin et al. (1968) take advantage of the 1968 event in France which leads to an increase in the passing rates for different qualifications to a further level of higher education which in turn allows the treatment group to obtain more years of higher education. They find that extra years of education for those on the margins have a positive and significant effect in transmitting education to the next generation and in increasing the academic attainment of their children at age 15. The above studies find intergenerational effects for both mothers and fathers; however some other studies find effects for only maternal education or paternal education. A study conducted by Black et al (2004) using compulsory schooling change in Norwegian finds

a small effect of mother's education on the years of education completed by her son, however no effect of father's schooling. Del Bono Galindo-Rueda (2007) finds opposite results in his study in UK after exploiting the change in compulsory schooling law which extended the minimum school leaving age from 14 to 15 years. He indicates no effect for mother's education on the schooling of her son, but positive effects for paternal schooling.

CHAPTER 3

BACKGROUND

3.1 The French educational system

The French educational system consists of three stages: primary education, secondary education, which is divided into two stages: Middle school and high school, and higher education. The education in France is obligatory from 6 to 16 years. Primary school (école primaire) consists of 5 years of study from the age of 6 to 11 and it is mandatory. Students start to learn a bit of everything: Grammar, History, Math and sometimes a little bit of English. The school after is the middle school (Collège). It lasts four years from the age of 12 to 15. Students learn French grammar, French literature, History, Geography, Chemistry, Physics, Biology and foreign languages. The last and fourth year of the middle school is the hardest one because at the end of the year there is a national exam called Brevet and this is the first official diploma. This certificate is necessary in order to go to high school and usually most of the students pass it. However, for students not interested into going to the general stream, there are some special education lines like technical college or technical high school, or they can simply drop out since education isn't mandatory after 16. After middle school, students attend high school (Lycée) for the final three years of their secondary education from the age of 16 to 18. To mark the end of their education in the secondary cycle, students prepare for the second and most important national exam called "Le *baccalauréat*" that lasts five days. The Baccalaureate in France is divided into three groups: the general,

technological and professional. The general baccalaureate is an academic diploma that leads to higher education rather than for trade or occupation where students can continue their education at university, in preparatory classes for a grande école, in a higher technicians' section (*STS*), or in specialized schools. However, the vocational baccalaureate presents 70 specialties in many different sectors such as maintenance, construction, commerce as well as very specialized sectors such as jewelers and fashion. The majority of students who pass this exam enter the workplace, although this diploma can entitle them the access to higher education. The last type is the technological baccalaureate which is awarded to students who have both general knowledge and training in modern technologies. Also it is constituted of eight types: industrial; science and technology; laboratory science; medical and social science; agriculture; environment; hotel and catering; music and dance.

3.2   Types of diplomas in France

The school curriculum in France is constituted of a set of academic and vocational credentials. The certificate of primary schooling examination (CEP) is a diploma received at the end of elementary primary education and certifies that the student can enter to French junior secondary schools (Collège). The Brevet diploma is awarded to students at the end of grade 9 (3e) and marks the end of the middle school or junior secondary schooling, but this qualification does not clearly indicate the completion of compulsory education and a very small proportions of students would hold it as their highest qualification. The Brevet drives to three pathways: the general, technological and vocational. By the end of secondary schooling, most qualified students will get the *Baccalaureate* and less academically oriented students will obtain the Certificat

d'Aptitude Professionnelle/Brevet d'Etudes Professionnelles (CAP/BEP) vocational qualifications. And these two essential credentials were received through examinations taken by pupils at the age of 17 or 18. The difference between the CAP and BEP is that the CAP teaches pupils specialized subjects and gives them a chance to gain more specialized skills, hence it mainly contributes to employment. However, the BEP practices pupils in more general training that is less specific training, and therefore it can lead on to the vocational or technological baccalaureate.

3.3 Grade repetition policy

In terms of the grade repetition policy, France was placed in the fifth position out of the 34 OECD countries in applying it in 2012. This policy is still wide spread, involving each year 270,000 school students in primary and secondary years. Students are required to repeat a grade after not acquiring the necessary level of knowledge and understanding to pass to the subsequent grade. At the age of 15, 28 per cent of students have repeated a grade at school at least once in their educational course, compared with an average of 12 per cent in the OECD countries. Also by the end of elementary school, about 17% of students have repeated a grade. However, this proportion is higher in the first year of upper secondary (36%) and it continues through the BAC.

CHAPTER 4

DATA

4.1 Labor Force Survey

Data on mothers and children's educational outcomes are taken from the French Labor Force Survey (LFS) to test the relationship between mother's level of education and children's academic performance. The LFS is well-suited for the objective of this study and is conducted every year by the French National Institute of Statistics and Economic Studies (INSEE). We limit our study to years from 1990 to 1998, so the sample is formed by 9 surveys. The survey covers approximately 100,000 households, which represents an average survey rate approximately 1/300. Only household members aged 15 years and above are interviewed three years in a row. The LFS contains demographic characteristics for parents and their children, more importantly information on their educational attainment. The dependent variable in this study is children's educational achievement represented by their school grade repetition. In the French context, repeating a grade is a good proxy for early student's performance in elementary school or junior high-school. However, the data do not provide this indicator explicitly, so we instead focus on whether children are in the ninth grade at age 15 or not by comparing their grade and age. So for example, children at the year of survey t born in t-15 are in the ninth grade (at least) if they have not repeated a grade. The independent variable is mother's educational attainment given by "the years of education accomplished by mothers" and "the highest diploma held", which we divided

into four categories: no qualification; less than high school degree (CEP or Brevet); senior secondary school or high school certificate which includes the Baccalaureate, advanced vocational training (CAP or BEP with the Brevet); and postsecondary education degree or higher education degree. Also various measures of the characteristics of children and their fathers were used as control variables. The inclusion of these covariates allows for the reduction of omitted variable bias and help to explain possible variation in the dependent variable. We include dummy control variables as covariates to capture whether the child is a female or male (male=1; female=0); whether he was born in France (France=1, another country=0), and whether his mother was born in France (France=1, another country=0). Also we include measures indicating paternal educational attainment and mothers' year of birth.

4.2 Data Sample and Summary Statistics

Our sample includes children aged 15 and their mothers. In total, the sample comprises 4,551 observations. We limit our analysis to families where both mothers and children aged 15 are observed in the household. The performance of the children at school is observed by looking at their grade repetition when they are aged 15 at the survey year, and their mother's educational attainment is observed by looking at their highest diploma held and their years of education. Our main objective is to measure the effect of mother's educational attainment on their children's grade repetition with and without some possible control variables.

To understand the demographic characteristics of the sample, a description of the dependent, independent and control variables is presented in Table 1. In Table 2, we present summary statistics for these variables where mean and standard deviations are

provided. The sample consists of 52% of male children and 48% of female children, where 40% of them are of French nationality. 27% of mothers are of French nationality. 54% of children have repeated their grade in their primary or junior schooling. Their grade repetition depends on the level of education attained by their mothers, where 25% of mothers have no qualification, 27% hold less than a high school degree, 35% hold a senior secondary schooling certificate and 13% hold a postsecondary degree. Also, the average year of mother's education is 10.77 years and the average date of mother's date of birth is 1952. Furthermore, we use father's credentials and years of education as control variables. 25% of fathers have no qualification, 19% hold less than a high school degree, 41% have a senior secondary schooling certificate and 15% have a postsecondary degree. And the average year of their education is 10.97 years.

CHAPTER 5

IDENTIFICATION STRATEGY

The main objective of this study is to capture the association between mother's educational attainment and their children's academic outcomes. A measurement of this relationship runs the risks of spurious effect due to mothers and children heterogeneity. To avoid these spurious effects, we use time fixed effect models that control for all unobserved variables changing across time (survey years), but not across mothers in each household. Formally, we run the following linear regression model:

$$Y_{it} = \beta_0 + \beta_1 D2_{it} + \beta_2 D3_{it} + \beta_3 D4_{it} + b_t + u_{it} \qquad (1)$$

Where Y_{it} refers to the outcome of interest for children's school performance which is their grade repetition. It is a dummy variable that takes on values of 1 if a child aged 15 is not yet at grade 9 and 0 otherwise. D2 is a dummy variable that takes on values of 1 if the mother didn't receive any diploma and 0 otherwise. Not receiving a diploma means that mothers are uneducated. D3 is another dummy variable indicating whether a mother received a senior secondary schooling certificate. It is equal to 1 in this case and 0 otherwise. Obtaining this certificate indicates that the mother finished high school. D4 is a dummy variable that takes on values of 1 if the mother obtained a postsecondary education diploma and 0 otherwise. D1 is the excluded dummy variable that is equal to 1 if the mother received less than a high school degree and 0 otherwise. We excluded it to avoid the dummy variable trap problem. Since we have more than two time periods

and to control for unobserved changes across different years, we include an unobserved

heterogeneity or a time fixed effect b_t. It denotes a set of dummy variables for each

survey year (1991 to 1998) except for the first year which is 1990. u_{it} is the

idiosyncratic error or the time-varying error. The coefficient β_1 represents the effect of

uneducated mothers on their children's grade repetition relative to mothers holding less

than a high school degree. The coefficient β_2 measures the effect of mothers who

received a secondary schooling degree on the grade repetition of their children relative

to mothers who obtained less than a high school degree. The coefficient β_3 shows the

impact of mothers who received a postsecondary education degree on their children's

grade repetition relative to mothers who received less than a high school degree.

  With the inclusion of time fixed effect in the first regression, potential bias decreased

but it is not eliminated. There are still many other omitted variables that are correlated

with both mother's attainment and grade repetition. Thus we add a set of controls to

remove bias coming from these variables. These control variables are represented by the

vector Xi that contains information on children's gender and nationality, their mothers'

nationality and year of birth, and their fathers' highest diploma received. So we run a

modified form of regression (1) that allows testing the association between mother's

educational attainment and their children's grade repetition with the inclusion of the

vector of a set of individual's characteristics:

$$Y_{it} = \beta_0 + \beta_1 D2_{it} + \beta_2 D3_{it} + \beta_3 D4_{it} + b_t + Xi + u_{it} \quad (2)$$

In this second equation, interpretations remain unchanged except for the fact of reducing omitted variables bias.

Another set of analyzes involves running a regression of children's grade repetition on mother's years of education. The linear regression model is the following:

$$Y_{it} = \beta_0 + \beta_1 X_{it} + b_t + u_{it} \qquad (3)$$

Where Y_{it} is a binary variable that indicates children's grade repetition. X_{it} is the independent variable that represents the years of education accomplished by the mother. b_t is the time fixed effect. β_1 is the coefficient of interest that measures the effect of an increase in mother's years of education on the probability that children's grade repetition occurs. u_{it} is the idiosyncratic error.

Also, we re-run the third regression but with the inclusion of some control variables to reduce omitted variable bias. The linear regression is the following:

$$Y_{it} = \beta_0 + \beta_1 X_{it} + b_t + Xi + u_{it} \qquad (4)$$

Where Xi is a set of control variables that contains information on children's gender and nationality, their mothers' nationality and year of birth, and the years of education accomplished by the father.

CHAPTER 6

RESULTS

Tables 3 and 4 present the results of the main analyses, in which we examined the association between maternal education and children's grade repetition. All results include time fixed effects. Specifically, table 3 shows the results of the effect of mother's credentials held on the probability of children's grade repetition .The results indicate that the model is highly significant and explain about 6% of the variance in the dependent variable "grade repetition" (R-squared=0.06). Interestingly, the children of mothers having no qualification are 16 percentage points more likely to repeat a grade relative to the children of mothers holding less than a high school degree. However, the likelihood of grade repetition for children of mothers holding a senior secondary school certificate decreases by 25 percentage points relative to the children of mothers holding less than a high school degree. And the likelihood of grade repetition for children whose mothers hold a postsecondary certificate decreases more by 61 percentage points relative to children whose mothers hold less than a high school degree. Besides, in order to examine the impact of mother's accomplished years of education on the likelihood of children's grade repetition, these two variables were regressed on each other .The results are presented in table 4 and indicate that this additional model is also highly significant and explain about 3% of the variance in the dependent variable "grade repetition" (R-squared=0.03). Findings suggest that a one more year of mother's education decreases the probability of children's grade repetition by 1.6 percentage points. Notably, mother's

education has a significant and negative effect on the probability of children's school grade repetition as expected.

Robustness Checks

In order to test the robustness of the findings, we re-estimated the above models of the effect of maternal education on children's grade repetition, controlling for variables that may have affected children's academic outcomes. We chose to include measures of children's gender and nationality, mother's nationality and year of birth, in addition to the credentials held by fathers, as well as their accomplished years of education. Column 2 of table 3 reports the corresponding fixed effect estimates for children's grade repetition with the inclusion of control variables. The results are also highly significant and suggest that children whose mothers are uneducated are 11 percentage points more likely to repeat a grade relative to children whose mothers hold less than a high school degree. However, the likelihood of grade repetition for children of mothers holding a postsecondary certificate decreases by 40 percentage points relative to mothers holding less than a high school degree. Furthermore, the second column of table 4 shows the corresponding fixed effect estimates for children's grade repetition with the inclusion of control variables. The results are also highly significant and indicate that a one year increase in mother's years of education decreases the probability of children's grade repetition by 0.8 percentage points.

Among the control variables, children's gender is a significant positive factor influencing their probability of grade retention. However, children and mother's nationality, in addition to mother's date of birth are insignificantly related to children's grade repetition. As expected, father's credentials estimates (high school and

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postsecondary diplomas) are significant and negatively associated with children's probability of grade repetition. Also father's years of education are negatively associated with children's grade repetition and the relationship is highly significant. For example, the probability of grade repetition for children whose fathers hold a senior secondary schooling degree decreases by 18 percentage points relative to children whose fathers hold less than a high school degree. Moreover, a one more year of father's education decreases children's grade repetition by 11 percentage points. Thus, the more the fathers are educated, the less is the probability of their children's grade repetition.

Consequently, when all control are simultaneously entered into the estimated models, similar negative and significant relationships are found between mother's educational attainment and children's school grade repetition. The only distinction is that the magnitude of effect sizes attenuates slightly when control variables are included in these models together. Altogether, findings suggest that above and beyond the predetermined control variables, maternal educational achievement significantly forecasts children's educational performance and leads to a reduction in their probability of school grade repetition.

CHAPTER 7

DISCUSSION

This study has examined the effects of mother's education on their children's educational performance at school. The results suggest that maternal education is an important factor in explaining children's achievement. The more the mothers are educated, the more their children perform better at school and the less is their probability of grade repetition. But the natural question that needs to be raised is why this is the case. Is it because more educated mothers have more educated children? or is it because more educated mothers hold more resources due to their higher education that can lead their children to perform better in school? To address this issue, our study investigates mother's monthly salary, employment and high skilled occupation and fertility as potential mediators and whether they explain the negative correlation between maternal education and their children's grade repetition.

Salary as a mediator of the relationship between maternal education and children's academic achievement

Previous studies state that the education of mothers raises their access to human, cultural and social capital which is in turn used by them in order to develop their children's academic performance (Harding et.al, 2015). Familial resources used by children have an influence on their educational performance (Englund et al., 2004 and Furstenberg, 2004). Klebanov et al. (1994) find that both maternal education and

parental income play an important role in predicting the physical environment and home learning experiences. Mulligan (1997) claims that wealthier parents care more about the development of their children. Also another researchers indicate that additional compulsory schooling leads to huge gains in earnings, and with these earnings, parents can provide their children better schools, and can afford better neighborhoods and nutrition (Acemoglu and Angrist, 2000; Oreopoulos ,2003). Extra family income can be beneficial for children by buying them goods like books, using it for preschool programs, and for good health care. And its effect on the achievement of children in math and reading is significant, and an 1000$ increase in family income increase math and reading test scores by about 6 percent of a standard deviation. However, children in poor families tend to face many challenges and one of them is the adverse home environment that can affect their development (Dahl et al., 2012). Several explanations are provided to explain the effect of family income on children development. McLoyd (1990) finds that poverty increases the level of parent's stress, depression, and bad health which can affect badly their ability to nourish their children. Another study by Parker et al. (1999) show that low-income parents present high level of exasperation and aggravation with their children, which can cause their children to have a poor verbal development and higher levels of distraction and feud.

Our results of both models of mother's years of education and highest diplomas held by them on their salary obtained, including control variables are presented in table 6. These models are highly significant and explain about 11% of the variance in the dependent variable (R-squared=0.11), and about 20% of the variance in the dependent variable (R-squared=0.20) respectively. Specifically, with the inclusion of control variables, one more year of mother's education increases her salary by 0.07%. Also the

salary of mothers with no credentials decreases by 20% relative to mothers holding less than a high school degree. Interestingly, mothers holding a postsecondary degree present an increase in their salary obtained by 43% compared to mothers holding less than a high school degree. Thus, the higher is the education of mothers, the higher is their salary.

Furthermore, our result of the regression of children's grade repetition on mother's salary including control variables is presented in table 9. The model is significant and explain about 6% of the variance in the dependent variable (R-squared=0.06). The result shows that a 100% increase in mother's salary leads to a decrease in the probability of children's grade repetition by 8 percentage points. Therefore, this study finds that mothers' salary has significant mediating effects on the relationship between mothers' education and children's grade repetition.

Employment and high skilled occupation as mediators of the relationship between maternal education and children's academic achievement

A previous study focusing on low-income families shows that there is positive correlation between early maternal employment and children's development, stating that early maternal employment may be more advantageous in families in which mother's earnings serve as an add to total family income (Lombardi et al., 2016). Gornick et.al (2003) find that early mother's employment can provide support for women's careers and lead to an increase in the economic resources for the family. Hoffman et al. (1999) indicate that maternal employment leads to children's development by providing

economic and social resources to families. The results of our models of the effect of mother's years of education and highest degree obtained by them on their likelihood of employment, including control variables are presented in table 7. Both models are significant and explain about 0.08% of the variance in the dependent variable (R-squared=0.0008), and about 0.11% of the variance in the dependent variable (R-squared=0.0011) respectively. The results of the regression show that a one year increase in mother's education increases their probability of being employed by 0.007 percentage points. Also the likelihood of uneducated mothers of being employed decreases by 0.21 percentage points relative to mothers obtaining less than a high school degree. And the probability of employment for mothers holding a postsecondary certificate increases by 0.22 percentage points compared to mothers having less than a high school degree.

We further focus on employed mothers having a high skilled occupation. The results of our models of the effect of mother's years of education and highest degree obtained by them on having a high skilled occupation, including control variables are also presented in table 7. The two models are highly significant and explain about 5% of the variance in the dependent variable (R-squared=0.05), and about 17% of the variance in the dependent variable (R-squared=0.17) respectively. The results show that a one year increase in mother's education increases their probability of having a high skilled occupation by 0.66 percentage points. Also the likelihood of uneducated mothers to obtain a high skilled occupation decreases by 1 percentage point relative to mothers obtaining less than a high school degree. And the probability of mothers who hold a postsecondary certificate to get a high skilled occupation increases by 28 percentage points compared to mothers who hold less than a high school degree. Thus, the more the

mothers are educated, the more is their probability of being employed and having a high skilled occupation.

Moreover, our results of the regressions of children's grade repetition on mother's employment and high skilled occupation including control variables are presented in table 9. The two models are significant and explain about 6% (R-squared=0.06) and 2% (R-squared=0.02) of the variance in the dependent variable respectively .The results show that the probability of grade repetition for children whose mothers are employed decreases by 16 percentage points relative to children whose mothers are unemployed and that for children whose mothers have a high skilled occupation decreases by 39 percentage points relative to children whose mothers do not a high skilled occupation. Therefore the above findings provide evidence that mother's employment and high skilled occupation significantly mediate the association between maternal education and children's grade repetition.

Fertility as a mediator of the relationship between maternal education and children's academic achievement

Previous literature indicates that there exists a strong negative relationship between education and fertility in postindustrial countries. In all cohorts, educated women have later first births and don't give birth to children compared to less educated women (Kravdal et al, 2008). Woman's education increases her permanent income through earnings and directs her fertility choices toward fewer children of higher quality (Gary S. Becker 1960; Jacob Mincer 1963; Becker and H. Gregg Lewis 1973; Robert J.

Willis 1973). Also education leads to an improvement in individual's knowledge about fertility choices and healthy pregnancy behaviors (Michael Grossman 1972). Our results of the regressions of mother's years of education and highest degree obtained by them on the number of children born, including control variables are presented in table 8. The two models are significant and explain about 2% of the variance in the dependent variable (R-squared=0.02), and about 0.9% of the variance in the dependent variable (R-squared=0.009) respectively. The results indicate a 0.012 decrease in the number of children in a family for a one year increase in mother's education. Also there is an increase by 0.09 in the number of children whose mothers are uneducated relative to mothers holding less than a high school degree. In contrast, there is a decrease by 0.09 in the number of children whose mothers hold postsecondary diploma relative to mothers holding less than a high school degree. Thus, mother's education leads to a decrease in their fertility.

Furthermore, our result of the regression of children's grade repetition on mother's fertility including control variables is presented in table 9. The model is significant and explain about 2% of the variance in the dependent variable (R-squared=0.02). The result shows an increase in children's probability of grade repetition by 3 percentage points for a one unit increase in the number of children born. Therefore, we find the variable 'mother's fertility' to function as a potential and significant mediator of the relationship between mother's education and children's grade repetition.

Evidence of these above models helps us build a theoretical understanding of the mechanisms that may be associated with maternal education and of the mediating effects of mother's salary, employment, high skilled occupation and fertility on the

negative relationship between maternal education and children's grade repetition at school.

CHAPTER 8

CONCLUSION

The analyses described in this research address an important question: Does an increase in mother's education improve the educational attainment of their children and reduce the probability of their grade repetition? Taking together the results from two sets of analyses presents consistent evidence of a negative correlation between maternal education and children's grade repetition. Using a time fixed effect model and data from the French Labor Force Survey (LFS), we find that a one year increase in mother's years of education suggests a decrease in the probability of children's grade repetition by 0.8 percentage points. Top on the list of possible explanations for the maternal education-child academic achievement relationship has been mother's wages, employment and high skilled occupation status, which are positively related to mother's educational attainment. Other plausible explanation includes mother's fertility which is negatively linked to mother's educational attainment. These variables are the potential significant mediators of the negative association between maternal education and children's school grade repetition. Our study highlights the importance of maternal education and considers it as a multi-dimensional structure, and states how the measurement of mother's education in different ways can inform us unique, yet corresponding evidence about the association with children's academic outcomes. Since the academic future of children depends on how they are brought up and taught during their childhood, maternal education is certainly a vital necessity and cannot be ignored (Awan, 2015).

In sum, this research enhances our understanding of the correlation between mother's educational attainment and children's academic outcomes and provides insight into how best to support mothers and boost their education because of their central socializing influence and in order to foster the healthy development and the better academic performance of their children at school. The importance of paternal education has been presented in the literature, but future work is needed to investigate its effect on children grade repetition, in addition to the mechanisms that mediates their relationship. Finally, since mother's education could have an impact on their teaching styles, patience, involvement and attitudes towards their children, learning more about these mechanisms that shapes children's outcomes is a challenge for future research.

APPENDIX

Table 1: Description of the variables used in this study

Variables	Description
School grade repetition(children aged 15)	=1 if children repeated a grade
Mothers' educational attainments	
No qualification	=1 if mothers didn't receive any diploma
Less than high school degree	=1 if mothers held CEP or Brevet diploma
Senior secondary schooling certificate	=1 if mothers held a high school degree
Postsecondary degree	=1 if mothers held a postsecondary education degree
Mother's years of education	The years of education accomplished by the mother
Control variables	
Father's credentials	The credentials held by the father
Father's years of education	The years of education accomplished by the father
Children's gender	=1 if a child was a male
Children's nationality	=1 if a child was born in France
Mother's nationality	=1 if a mother was born in France
Mother's year of birth	The year of birth of mothers
Mediators	
Mother's Salary	The monthly net salary from main occupation
Mother's employment	=1 if the mother had an employment
Mother's occupation	=1 if the mother had a high skilled occupation
Mother's fertility	The number of children in each household

Table 2: Summary Statistics

Individual characteristics	Mean	S.d	No.obs.
Children's gender	0.52	.5	4,551
Children's nationality	.4	.43	4,551
Mother's nationality	.27	.13	4,551
Mother's year of birth	1952	6.04	4,551
Father's credentials			
No qualification	.25	.42	4,551
Less than high school degree	.19	.11	4,551
Senior secondary schooling certificate	.41	.15	4,551
Postsecondary degree	.15	.09	4,551
Father's years of education	10.97	5.39	4,551
Children's school performance			
Grade repetition	.54	.5	4,551
Mother's credentials			
No qualification	.25	.43	4,551
Less high school degree	.27	.14	4,551
Senior secondary schooling certificate	.35	.15	4,551
Postsecondary degree	.13	.11	4,551
Mother's years of education	10.77	5.13	4,551

Notes: The table reports the mean, the standard deviation and the number of observations. All statistics are calculated for the sample of all mothers and their children at age 15 in each household. The sample consisted of 52 percent of male children and 48 percent of female children. 40 percent of the children are of French nationality and 27 percent of mothers are of French nationality. 54 percent of them have repeated their grade in their primary or junior schooling. 25 percent of mothers did not receive any diploma, 27 percent of them hold less than a high school degree, 35 percent hold a senior secondary schooling certificate and 13 percent hold a postsecondary degree. The average year of maternal education is 10.77 years and the average year of mother's year of birth is 1952. Father's credentials and years of education are control variables. 25 percent of fathers have no qualification, 19 percent of fathers have less than a high school degree, 41 percent have a senior secondary schooling certificate and 15 percent have a postsecondary degree. And the average years of paternal education is 10.97 years.

Table 3: The effect of mother's highest credentials held on their children's grade repetition

Mother's educational attainment	Coefficients (Standard error)	
	Grade repetition	Grade repetition
No qualification	.16 ***	.11***
	(.02)	(.02)
Senior secondary school certificate	-.25***	-.24***
	(.06)	(.07)
Postsecondary certificate	-.61***	-.4***
	(.07)	(.09)
Time Fixed effect	Yes	Yes
Controls	No	Yes
Number of observations	4,551	4,551

Notes: Time fixed effect are the year-of-survey fixed effects that control for variables that vary across time. Control variables include dummy variables for father's highest diplomas (one equal to 1 if the father has no qualification, one equal to 1 if the father holds a high school degree and another one equal to 1 if the father holds a postsecondary degree), a dummy variable denoting the gender of children (equals to 1 if the child is a male), dummy variables denoting the nationality of children and their mothers respectively (equal to 1 if the children and their mothers are of French nationality), and a continuous variable representing the years of birth of mothers.
*** $p < 0.01$

Table 4: The effect of mother's years of education on their children's grade repetition

Mother's education	Coefficients (Standard error)	
	Grade repetition	Grade repetition
Years of education accomplished by mothers	-.016***	-.008***
	(.002)	(.003)
Time fixed effect	Yes	Yes
Controls	No	Yes
Number of observations	4,551	4,551

Notes: Time fixed effect are the year-of-survey fixed effects that control for variables that vary across time. Control variables include a continuous variable referring to the years of education accomplished by fathers, a dummy variable denoting the gender of children (equals to 1 if the child is a male), dummy variables denoting the nationality of children and their mothers (equal to 1 if the children and their mothers are of French nationality), and a continuous variable representing the years of birth of mothers.
*** $p < 0.01$

Table 5: Summary Statistics

Variables	Mean	S.d	No.obs.
Dependent variables			
Mother's employment	0.99	0.06	202,203
Mother's high skilled occupation	0.09	0.28	202,203
Mother's salary	8.64	0.64	202,203
Children number in each household	1.1	1.05	202,203
Independent variables			
Mother's years of education	13.03	9.06	202,203
Mother's credentials			
No qualification	0.15	0.36	202,203
Less than a high school degree	0.22	0.41	202,203
Senior secondary schooling degree	0.4	0.5	202,203
Postsecondary degree	0.23	0.42	202,203
Controls			
Mother's nationality	0.94	0.24	202,203

Notes: The table reports the mean, the standard deviation and the number of observations. All statistics are calculated for the sample of all mothers and their children in each household. 94 percent of the respondents (mothers) are of French nationality. 99 percent of them have an employment, where only 9% have a high skilled occupation .The mean mother's log salary is 8.64 percent. The average number of children in each household is 1.1. The average year of maternal education is 13.03 years. A majority of mothers (40%) have a senior secondary schooling degree(a high school degree), while 15 percent of them do not receive education, 22 percent have a less than a high school degree and 23 percent have a postsecondary degree.

Table 6: The effect of mother's education on their monthly salary

Mother's education	Coefficients (standard error)	
	Mother's salary	Mother's salary
Years of education accomplished by mothers	.006***	.0007***
	(.0003)	(.0002)
Credentials		
No qualification	-.22***	-.20***
	(.005)	(.005)
Senior secondary school certificate	.16***	.15***
	(.004)	(.004)
Postsecondary certificate	.56***	.43***
	(.004)	(.004)
Time fixed effect	Yes	Yes
Controls	No	Yes
Number of observations	202,203	202,203

Notes: Time fixed effect are the year-of-survey fixed effects that control for variables that vary across time. Control variables include dummy variables for mother's employment, high skilled occupation, and mother's fertility, and a dummy variable denoting the nationality of mothers (equals to 1 if the mother is of French nationality).
*** $p < 0.01$

Table 7: The effect of mother's education on being employed and having a high skilled occupation

Mother's education	Coefficients (Standard error)			
	Employment	Employment	High skilled occupation	High skilled occupation
Years of education accomplished by mothers	.00008***	.00007***	.0067***	.0066***
	(.000008)	(.000008)	(.00013)	(.00013)
Credentials				
No qualification	-.0022***	-.0021***	-.01***	-.01***
	(.0006)	(.0006)	(.0008)	(.0008)
Senior secondary school certificate	0.00007	0.00005	.0183***	.0182***
	(.0004)	(.0004)	(.0009)	(.0009)
Postsecondary certificate	.0023***	.0022***	.29***	.28***
	(.0004)	(.0004)	(.002)	(.002)
Time fixed effect	Yes	Yes	Yes	Yes
Controls	No	Yes	No	Yes
Number of observations	202,203	202,203	202,203	202,203

Notes: Time fixed effect are the year-of-survey fixed effects that control for variables that vary across time. Control variables include continuous variables which are mother's salary and fertility, and a dummy variable denoting the nationality of mothers (equals to 1 if the mother is of French nationality).
*** $p < 0.01$

Table 8: The effect of mother's education on the number of children born

Mother's education	Coefficients (standard error)	
	Children's number	Children's number
Years of education accomplished by mothers	-.013***	-.012***
	(.0001)	(.0001)
Credentials		
No qualification	.12***	.09***
	(.008)	(.008)
Senior secondary school certificate	-.02***	-.01*
	(.006)	(.006)
Postsecondary certificate	-.12***	-.09***
	(.007)	(.007)
Time fixed effect	Yes	Yes
Controls	No	Yes
Number of observations	202,203	202,203

Notes: Time fixed effect are the year-of-survey fixed effects that control for variables that vary across time. Control variables include a continuous variable which is mother's salary, a dummy variable equals to 1 if mothers have a high skilled occupation and a dummy variable denoting the nationality of mothers (equals to 1 if the mother is of French nationality).
∗ p < 0.10, ∗∗∗ p < 0.01

Table 9: The effect of mother's salary, employment, high skilled occupation and fertility on children's grade repetition

Mechanisms	Coefficients (standard error)	
	Children's grade repetition	Children's grade repetition
Mother's salary	-.11***	-.08***
	(.015)	(.016)
Mother's employment	-.17***	-.16**
	(.03)	(.06)
Mother's high skilled occupation	-.67***	-.39***
	(.11)	(.13)
Mother's fertility	.06***	.03***
	(.006)	(.01)
Time fixed effect	Yes	Yes
Controls	No	Yes
Number of observations	4,475	4,475

Notes: Time fixed effect are the year-of-survey fixed effects that control for variables that vary across time. Control variables include a dummy variable denoting the gender of children (equals to 1 if the child is a male) and a dummy variable denoting the nationality of children (equals to 1 if the child is of French nationality).
*** $p < 0.01$, ** $p < 0.05$

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