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Direct and Crowding-out Effects on a Hepatitis B Vaccination Campaign

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Abstract

We evaluate the direct and spillover causal effects of a Hepatitis B (HB) vaccination campaign in French schools on the vaccination adherence of the targeted pupils. Using a regression discontinuity design, we show that this campaign created an exogenous shock on vaccination behaviour, increasing the HB vaccination rate for children aged 11 and above. At the same time, we show a drop in the measles, mumps, and rubella (MMR) vaccination rate of the targeted pupils and an increase in the parental belief that measles is a benign disease. We interpret these results as a salience effect: the focus on HB vaccination leads to a decrease in the belief that other vaccines are as important. The effect on MMR vaccination was relatively unexpected and may imply a negative externality. Measles is an extremely contagious disease. If the vaccination rate falls, the disease will spread further, raising the question of the net effect of the HB vaccination campaign on the well-being of the population.

JEL Codes: I10, I12, J18
Keywords: vaccination campaign, hepatitis B, measles, mumps, rubella, spillover effects, regression discontinuity design

INTRODUCTION

Vaccination is an individual choice or a parent's decision for her child but this choice generates positive collective externalities. An individual who is vaccinated against an infectious disease not only decreases her likelihood of being infected, but also the likelihood of others becoming infected.[1] If a sufficiently high vaccination rate is reached, this can lead to the eradication of the disease. Public policymakers, when implementing a vaccination campaign, thus need to

[1] This choice may also be affected by the vaccination choices of others. As vaccination reduces the transmission of an infectious disease, it can provide an incentive for individuals to be free-riders, i.e., to benefit from the vaccination of others while avoiding the costs of vaccination.

anticipate the reactions of the population and even more so if the net effect of the campaign is impacted by potential spillovers on vaccines not targeted by the campaign. The literature shows that vaccination campaigns can lead to spillover effects beyond their intended effect on the targeted disease and the targeted population (Bouckaert et al., 2020; Carpenter and Lawler, 2019; Churchill, 2021; Hirani, 2021; Moghtaderi and Dor, 2021).

Our paper focuses on the causal effects of a Hepatitis B (HB) vaccination campaign in France on rates of vaccines targeted and untargeted by the campaign. In 1994, a major communication campaign against HB was implemented, directed towards young people. From September 1994 onwards, free vaccination was offered to pupils in middle and high schools, i.e., to pupils aged 11 and above. Using data from the 1995 Health Barometer collected by the French National Public Health Agency, we exploit the discontinuity in the probability of eligibility for the vaccination campaign at the age of 11. We investigate both the direct effect of the campaign on HB vaccination of children, and its spillover effects on vaccination for another infectious disease: the Measles, Mumps and Rubella (MMR) vaccination.

We find a large direct effect of the 1994 campaign on children's HB vaccination rates, i.e. +40 percentage points (pp) for children aged 11 and more, suggesting that the policy was very effective at increasing vaccination for the targeted disease. More surprisingly, our estimates reveal a spillover effect of the campaign: a 13 pp decrease in the MMR vaccination rates for children impacted by the campaign.[2] This striking result is confirmed by additional results on parents' beliefs about the MMR illnesses as well as several robustness checks. We investigate the potential mechanisms that may lead to this negative spillover effect of the campaign and conclude with the existence of a salience effect, i.e. individuals focus their cognitive resources on the sole vaccine targeted by the campaign.

[2] In the 1990s, teenagers had rarely been vaccinated against MMR when they were children. They were therefore vaccinated later, as teenagers. Our results show that this vaccination stopped with the 1994 campaign, leading to a lower proportion of treated teenagers vaccinated against MMR.

Our paper adds to the existing literature in several ways. First, we complement the literature on the effectiveness of vaccination campaigns. The recent literature shows that vaccination campaigns – either communication or mandatory campaigns – have proved to be very effective at increasing vaccination rates for the disease targeted (Abrevaya and Mulligan, 2011; Ward, 2014; Chang, 2016; Böhm et al., 2017; Carpenter and Lawler, 2019; Lawler, 2017; Brilli et al., 2020; Bütikofer and Salvanes, 2020; Frio and França, 2021; Hirani, 2021; Churchill, 2021). We confirm that policies implemented at school have a large and positive effect on vaccination rates.

We also add new insight to the literature that investigates the spillover effects of vaccination campaigns. The literature rarely focuses on spillover effects, and when it does, positive spillovers are often observed. Carpenter and Lawler (2019) find positive spillover effects of legal requirements for pupils to have the tetanus, diphtheria, and pertussis (TDP) vaccine before starting middle school. These mandates increase TDP vaccination adherence, but also adolescent vaccination rates for meningococcal disease and human papillomavirus (HPV). Similarly, Churchill (2021) finds that HPV vaccine requirement is positively associated with influenza vaccination[3], while Lawler (2017) identifies no effect of the hepatitis A vaccination campaign on other childhood diseases. Spillover effects can also be observed among individuals untargeted by the campaign. Bouckaert et al. (2020) show that a flu vaccination campaign directed at individuals over 65 has spillover effects within families: it increases vaccination rates against influenza of the younger partners. However, recent literature also reveals that such campaigns may lead to negative and unexpected spillover effects, especially for individuals indirectly concerned by the campaign. Bouckaert et al. (2020) show that children of individuals targeted by the campaign have a lower probability of being vaccinated against the flu. Moreover, Hirani (2021) shows that the relaunch letters sent to parents of two-year-old children informing them about

[3]Moghtaderi and Dor (2021) also find positive spillover effects following a recommendation campaign as they show that women vaccinated against Human Papillomavirus (HPV) are more likely to do screening tests, due to increased awareness of the benefits of prevention.

the incomplete vaccination of their child, leads to a drop in the vaccination of siblings under the age of 2.[4] Our paper complements the literature on negative and unexpected effects of vaccination campaigns. Interestingly enough, we find negative spillovers on a vaccine not targeted by the campaign, while previous papers found negative spillovers on the population untargeted by the campaign (e.g. children or siblings of the targeted individuals).

More generally, our work contributes to the literature on unintended spillover effects of health interventions (see, e.g., Abouk et al., 2023; DiNardo and Lemieux, 2001; Douven et al., 2015; Kim, 2021) or of public policy campaigns as a whole (see, e.g., Chuan et al., 2021; Busch et al., 2014; Gregory and Zierahn, 2022; Byrne et al., 2023; Cheshire et al., 2018).

The paper proceeds as follows. Section I examines in more detail the 1994 vaccination campaign and the vaccination schedule in France. The empirical strategy is presented in Section II. Section III describes the data and presents some descriptive statistics. Section IV reports on the main results, as well as some robustness checks and potential mechanisms that may drive our results. Section V presents the final discussion and concludes.

I THE 1994 HB VACCINATION CAMPAIGN AND THE VACCINATION SCHEDULE IN FRANCE

A The 1994 HB Vaccination Campaign

HB is an infectious disease leading to chronic disease with a risk of death from cirrhosis and liver cancer. The HB virus is transmitted through sexual relations and blood, or at birth from the mother to the child (Wright and Lau, 1993). Given these modes of transmission, the risk of contracting HB is not linear across age groups: it is low during childhood, a peak is reached for the 20-29 year-old group,

[4] Spillover effects are also observed in the case of a disease outbreak (eg. Oster (2018); Philipson (1996); Schober (2020)) or when a controversy arises, as was the case in the UK and the US for the MMR vaccine. Anderberg et al. (2011) and Chang (2018) both show that, as soon as the controversy broke out, vaccination against MMR declined as well as vaccination uptake of other uncontroversial childhood vaccines.

after which the risk decreases (Nauche, 2001). HB is a widespread world disease, but in France, endemicity is quite low: chronic HB is estimated to affect about 0.65% of adults aged 18 to 80 (Meffre et al., 2006). In 1992, the WHO ratified the proposal for universal HB vaccination, regardless of the level of endemicity in the country. In countries like France where endemicity was lower than 2%, the WHO recommended the vaccination of all teenagers and of newborns. The goal was to reach, after a few decades, the threshold of 80% of individuals vaccinated against HB to eradicate the disease.

Therefore, in France in 1994, the Health Minister announced a massive and national vaccination campaign to eradicate HB, directed at teenagers.[5] Other countries also implemented such campaigns at that time, see for example the "National Hepatitis B Immunization Plan" in China in 1992 (Huang et al., 2023). The campaign was implemented in two steps. First, in June 1994, the French government subsidized and launched a major communication campaign, mainly directed toward young people, through TV and radio commercials, ad inserts, billboards, and the distribution of leaflets.

Second, from September 1994 onwards, a free vaccination campaign was launched jointly by the Ministry of Health and the Ministry of Education, targeting all pupils enrolled in middle and high school, and therefore aged 11 and above. The choice to target middle and high school students aimed at reaching individuals just before risk exposure. There is virtually no HB transmission at these ages (Nauche, 2001). This second part of the campaign had been announced in June. Explanatory letters were first sent to parents, informing them about the health risks incurred by their non-vaccinated children, and about the implementation of a free vaccination campaign at their child's middle or high school. This was then an "opt-out" policy: parents had to justify their opposition to vaccination at school.[6] For those who accepted the vaccination, three injections

[5]Before 1994, only at-risk individuals (eg. people who use drugs) were invited to get vaccinated against HB and the vaccination was only mandatory for health professionals since 1991 (Nauche, 2001). However, there was no recommendation for children and teenagers concerning this vaccination.

[6]Common reasons for opposition to vaccination at school were: i) general opposition to vaccination; ii) preference for having the injection performed by the family doctor; iii) vaccination had already been

of the vaccine were administered in all schools between January and July 1995 (Brice, 1996). Parents also had the opportunity to get their children vaccinated by the family doctor. However, there were financial incentives to choose school vaccination: it was free at school, while payable when the three injections were performed during three consultations (they had to pay for the consultations and the vaccines). As a consequence, in 1995, among HB vaccinated pupils aged 11 and more, only 21% had been vaccinated by their family doctor (Brice, 1996).

Soon after the launch of the campaign, the HB vaccine was held responsible for causing multiple sclerosis, leading to a huge controversy regarding the risk of side effects associated with the vaccine.[7] Consequently, following the precautionary principle, the vaccination campaign was interrupted in schools in September 1998; it only lasted 4 academic years. In this paper, we use data collected before the emergence of the controversy. Our aim is therefore to focus on the impact of the campaign, and not on the effect of the outcry.

B The MMR vaccination within the immunization schedule

At the beginning of the 1990s, only the tuberculosis vaccine was mandatory to enter kindergarten and school. The immunization schedule also included three vaccines for TDP, pertussis and MMR. All three were recommended but not mandatory.

We focus our paper on MMR vaccination for two reasons: i) these three diseases can be particularly dangerous and highly contagious (Banatvala and Brown, 2004; Hviid et al., 2008; Perry and Halsey, 2004). Therefore, an identified side effect on this vaccine would change the global benefit of the vaccination campaign; ii) the data are unfortunately unavailable for the other vaccines.[8] The

performed.

[7]The first French scientific article on central nervous system demyelination potentially caused by HB was published in June 1995 (Kaplanski et al., 1995) Access to this information was restricted to researchers belonging to the scientific community and articles in the press, broadcasting these results, were published from 1996 onwards. The first television news that mentioned the potential link between HB and multiple sclerosis was broadcast on the 13th of December 1996 (source: National Audiovisual Institute).

[8]In France, no other databases dating back to those years and that contain information on more vaccines could be found.

MMR vaccine was included in the immunization schedule in 1986 (see Figure A1 in the Online Appendix). Vaccination against the MMR is usually considered as an infant vaccination. In theory, the first injection of the MMR vaccine needs to be administered at 12 months and the second one between 16 and 18 months. However, in practice, during the 1990s, the situation was very different: the injection was given at any age between 1 and 18 years old, as well as during adulthood for all individuals previously not vaccinated. More precisely, Figure A2 in the Online Appendix shows that only 20% (resp. 38%) of individuals born in 1981 (resp. in 1984), i.e., who were 14 (resp. 11) in 1995, had been vaccinated against the MMR at the age of 2 (INVS, 2003). Vaccination against the MMR was then also administered later, as 40% (resp. 60%) of them had been vaccinated at the age of 6. At the age of 16, about 80% had been vaccinated against the MMR (see section IV). Overall, it was usual for teenagers to get the MMR vaccination if they had not been vaccinated during their childhood and this vaccination was performed by the family doctor or a nurse. During the campaign, teenagers did not have the possibility to get vaccinated at school, at the same time as they received the injection of the vaccine against HB. Later, due to the inclusion of the MMR in the vaccination schedule, vaccination against the MMR mostly became an infant vaccination: 90% of children born in 1999 were vaccinated before the age of 2 (see Figure A2).

II EMPIRICAL STRATEGY: A REGRESSION DISCONTINUITY APPROACH

In order to estimate the causal effects of the 1994 vaccination campaign on vaccination adherence, we use a regression discontinuity design. Our identifying strategy exploits the discontinuity in the probability of eligibility for the vaccination campaign at the age of 11. Specifically, we use local linear regressions (Hahn et al., 2001; Imbens and Lemieux, 2008). This amounts to selecting the observations within a bandwidth on either side of the cut-off (age 11) and estimating the effect of eligibility to the campaign on Y_i (HB and MMR vaccination rates), as the effect of the dummy $\mathbb{1}_{A_i \geq 11}$ on Y_i in the following equation:

$$Y_i = a_0 + a_1 \mathbb{1}_{A_i \geq 11} + a_2 f(A_i - 11) \times \mathbb{1}_{A_i < 11} + a_3 f(A_i - 11) \times \mathbb{1}_{A_i \geq 11} + u_i \quad (1)$$

A_i is the age of the child in 1995 and a_1 identifies the causal effect of the 1994 vaccination campaign on the outcomes. As the vaccination campaign was implemented in two steps, a_1 measures the impact of both the communication campaign and eligibility to the free vaccination scheme, whose own effect cannot be distinguished.[9]

Our running variable is the child's age. However, eligibility for free vaccination is based on school enrolment in middle or high school: age is not the exact variable determining treatment. Some 10-year-old pupils, who were ahead of their year, could be eligible for free vaccination while some 11-year-old pupils who were behind their year could be ineligible. In practice, the 11 years old threshold defines relatively correctly children targeted or not by the campaign: 97% of children were 11 or older on starting middle school (Brice, 1996). We will perform robustness checks to analyze the sensitivity of our results to the exclusion of partially treated children, i.e., children of 10 and/or 11 years old.

We estimate equation (1) using a local linear function of the distance to the cut-off $(A_i - 11)$, defined as $(A_i - 11)\mathbb{1}_{A_i < 11}$ and $(A_i - 11)\mathbb{1}_{A_i \geq 11}$, which is continuous at the age of 11. We also use an alternative specification that considers a local linear spline function of age (results in the Online Appendix). Our running variable, the age of the child, is a discrete variable, which is quite common in the literature (see, for example, recent papers from Chyn et al., 2021; Takayu and Yokoyama, 2021; Gong et al., 2020).[10] However, in the case of a discrete running variable, the treatment of standard errors requires much attention. Those have

[9]The use of a regression discontinuity in a fuzzy design (i.e., a 2nd step that estimates the impact of an increase in HB vaccination on MMR vaccination) will be considered in the section "mechanisms". But in the main analysis, we do not want to impose the restrictive hypothesis that change in the MMR vaccination only results from vaccination against HB, as is the case in a fuzzy regression discontinuity design.

[10]Indeed, we do not observe the exact date of birth, but only the child's *year* of birth.

long been clustered by the running variable, as suggested by Lee and Card (2008). However, more recently, Kolesár and Rothe (2018) recommended against such a method as confidence intervals have poor coverage properties. Therefore, we do not cluster standard errors by age of the child, and use heteroskedasticity-robust standard errors, as suggested by Kolesár and Rothe (2018).

Regressions are performed using a bandwidth of 5 years around the age threshold: we restrict the sample to children aged between 6 and 15. As mentioned in Cattaneo et al. (2019), because our running variable is discrete, we cannot apply formal procedures of optimal bandwidth selection. However, the choice of the bandwidth is crucial and leads to a trade-off between bias and precision of the estimates. A smaller bandwidth decreases the bias while a larger bandwidth increases precision. Therefore, we performed robustness checks using larger (6 years) or smaller (2, 3 or 4 years) bandwidths, in order to test the sensitivity of our results to the choice of the bandwidth. Results are presented in the Online Appendix.

In order to estimate the *causal* effect of the campaign, the expectations of the potential outcomes conditional on A are to be continuous at age 11. Because this hypothesis is not testable, we first checked that variables related to the outcomes, but defined prior to the vaccination campaign (e.g., gender, age and level of education of the head of household, percentage of married couples, rural/urban location), are continuously distributed at the age of 11, which is the case (see Figures A6 and Tables A7 to A15 in the Online Appendix). Moreover, as explained in Section I-A, children above and below the threshold are comparable in terms of risk of contracting HB (close to 0), the risk of transmission occurring mostly between 20 and 29 years old (Nauche, 2001).

Second, a_1 and treatment status (eligibility to the free vaccination campaign) are assumed to be locally jointly independent of the age of the eldest child. This condition implies that children and their parents do not have perfect control over the age at which children go to middle and high school: they cannot manipulate the age threshold in order to benefit from the vaccination campaign. This is very likely to be the case. In fact, teachers are the most likely to have control over this. Moreover, making children skip a year in order to benefit from the campaign seems very implausible, or even impossible in our case. Even if it was the case, the vaccination campaign had been announced in June, when decisions to skip a year had already been taken. We formally analyzed this possibility by testing the continuity in the number of children of each age, as is usually done in regression discontinuity designs (McCrary, 2008). We do not find evidence of manipulation: this variable is continuously distributed before and after the age of 11 (see Figure A16 in the Online Appendix).

III THE DATA

A The 1995 Health Barometer

The regression discontinuity design is applied to data from the 1995 Health Barometer, a national survey representative of the French population and collected by the French National Public Health Agency.[11]Footnote 11 has been added. Data collection took place in November and December 1995, one year after the beginning of the vaccination campaign and before the polemic about potential side effects of the HB vaccine.[12] For each household, the dataset contains information on parents and children still living at home. In addition to the usual socio-demographic characteristics (age, gender, profession, education of each member of the household, etc.), the survey contains information on health status, access to health care and vaccination behaviour of parents and their children.

The initial database contains 1,993 households. We exclude households that are childless, ending up with a sample containing 764 households and 1,370 children. For the econometric analysis, we need to distinguish households exposed to the campaign from those who were not, i.e., treated and untreated

[11]A detailed description of the data collection, sampling and representativeness of the sample compared to the French population in 1995 is presented in the Online Appendix, section III.

[12]Our data were also collected before the polemic about the potential link between autism and MMR that broke out in 1998. More generally, no polemic on vaccination had ever broken out.

individuals.

In the main analysis, we only keep a sample composed of the eldest child of the family in order to avoid some parents being both treated and untreated.[13] Given the timing of the reform, a parent whose eldest child was 11 or more in 1995 is defined as treated, while a parent whose eldest child was 10 and below is defined as untreated.[14] This sample is composed of 564 observations. For the econometric analysis (baseline results), it needs to be restricted to children aged between 6 and 15 years old (bandwidth of 5 years around the threshold of 11), leading to a sample of 394 observations, with 231 treated parents and children and 163 untreated parents and children. We also consider an alternative sample composed of all children. All children aged 11 and more in 1995 are defined as treated, while those aged 10 and below are defined as untreated. This sample is composed of 1,100 observations. Again, for the econometric analysis, restricting the sample to children aged between 6 and 15 years old leads to a sample containing 717 observations, with 347 treated children and 370 untreated ones.

B Descriptive statistics

Table 1 provides descriptive statistics on the whole sample (column 1) and for both the untreated (column 2) and treated (column 3) groups. It first reports variables that relate to the head of the household.[15] The average age of the respondent is 36. Unsurprisingly, parents whose eldest child is older than 11 (treated group) are significantly older (approximately 5 years older) than parents whose eldest child is younger than 10 (untreated). However, our estimates are valid as soon as the age of the respondent is continuous at the 11 years old threshold, which is the case (see Figure A6b and Table A8 in the Online Appendix). More-

[13] It would be the case if, in the same family, some of the children are older than 11 while some others are younger than 10 in 1995.

[14] The database does not contain the children's age in months or the date of birth: we cannot be more precise in the definition of treated and untreated households.

[15] There are no variables characterizing the child, except their age and immunization status towards 2 diseases, MMR and HB.

Table 1: Comparison of treated and untreated groups, using a bandwidth of 5 years around the 11 years old threshold

	(1) Whole sample 6-15 yo child	(2) Untreated 6-10 yo	(3) Treated 11-15 yo	(4) T-test 6-15 yo
	Mean	Mean	Mean	b
Socio-demographic characteristics				
Head of household:				
Male	0.35	0.33	0.36	0.03
Age	38.65	35.82	40.65	4.83***
Age at childbirth	27.61	27.71	28.11	-0.18
French nationality	0.97	0.98	0.96	-0.01
No religion	0.24	0.24	0.24	-0.00
High school diploma and more	0.38	0.43	0.35	-0.08
Chronic diseases	0.23	0.18	0.26	0.07
Farmer	0.03	0.04	0.03	-0.02
Craftsman	0.03	0.01	0.03	0.02
Executive	0.11	0.09	0.13	0.03
Employee	0.47	0.53	0.44	-0.09
Blue collar worker	0.33	0.30	0.35	0.05
Pensioner	0.01	0.00	0.02	0.02
Other profession	0.02	0.02	0.01	-0.02
Household:				
Large cities (>200,000 inhab.)	0.30	0.30	0.31	0.01
Small cities (2,000-200,000 inhab.)	0.37	0.35	0.37	0.02
Rural area	0.32	0.35	0.31	-0.04
Equivalised income>1,500€	0.70	0.73	0.68	-0.05
In a relationship	0.87	0.90	0.85	-0.05
Outcomes				
Child HB vaccination	0.55	0.25	0.76	0.51***
Child MMR vaccination	0.86	0.93	0.80	-0.13***
Nb obs. (main sample: eldest child)	394	163	231	394
Nb obs. (alternative sample: all children)	717	370	347	717

Note: ***Statistically significant at the 0.1% level. Column (1) computes the mean for the entire sample. Figures in columns (2) and (3) are computed using a bandwidth of 5 years around the 11 years old threshold and on the main sample composed of the eldest child of the family. Column (4) reports the coefficient and significance level of the test for equal means.
Source: Health Barometer 1995.

over, age at childbirth is not significantly different between treated and untreated groups. 36% of the respondents are men and 95% hold the French nationality; these proportions are the same on both sides of the discontinuity threshold. The remaining socio-demographic characteristics of the respondents (chronic disease, education, profession, religion) do not significantly differ between the treated and untreated groups. Figure A6 in the Online Appendix shows continuity in these characteristics around the threshold of 11 years old, which is confirmed by additional regressions (Tables A7 to A13).

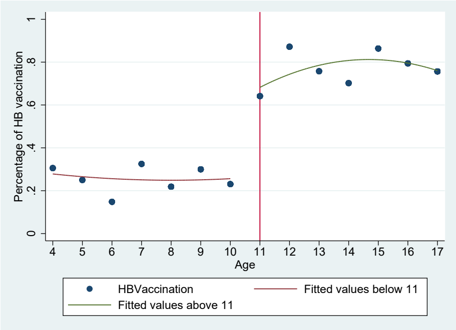
For variables that relate to the entire household (such as marital status, location and level of income), we do not observe any significant difference between treated and untreated groups. The continuity of these variables is also confirmed by Figure A6 and Tables A14 and A15.

The second part of Table 1 provides some statistics on the outcomes used in the econometric analysis.[16] Treated children are 51 pp more likely to be vaccinated against HB than untreated children. They are also 13 pp less likely to be vaccinated against MMR.

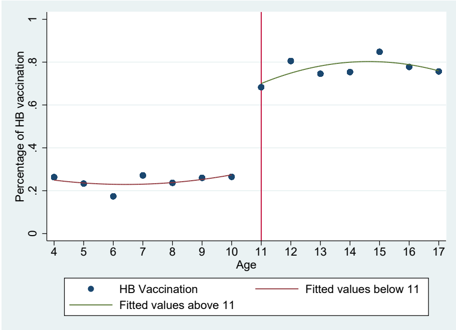
C Graphical evidence

Before presenting the results of the econometric analysis, we provide some graphical evidence on the impact of eligibility to the HB vaccination campaign. Figure 1 reports the HB vaccination rate by age of child. We observe a huge impact of the campaign on the probability of being HB vaccinated, consistent with an opt-out policy. There is a large discontinuity at the age of 11 in 1995, irrespective of the sample considered (eldest child of the household, see Figure 1a, or all children in the household, see Figure 1b). About 70% of children aged 11 or more were vaccinated against HB, while this proportion is only 30% for pupils aged below 10. The vaccination campaign targeted pupils starting

[16]The parent answers 2 questions: "Is your under-18 child vaccinated against HB?" (yes=1; no=0) and "Have you ever vaccinated your 1-16 years old child against MMR?" (yes=1; no=0). This means that the vaccination status variables denote the probability of being vaccinated at a certain age, including vaccinations performed before this age.

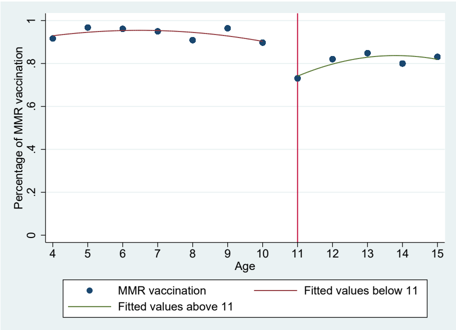


(a) Child HB vaccination rate, by age of the eldest child (Sample: eldest child of the household; N=564)

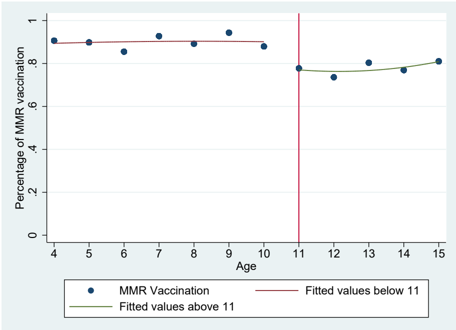


(b) Child HB vaccination rate, by age of the child (Sample: all children of the household; N=1100)

Figure 1: HB vaccination



(a) Child MMR vaccination, by age of the eldest child (Sample: eldest child of the household; N=564)



(b) Child MMR vaccination, by age of the child (Sample: all children of the household; N=1100)

Note: There is no information on MMR vaccination for children aged 16 and 17 in the survey.

Figure 2: MMR vaccination

middle school but also all pupils in middle and high school who had never been vaccinated. This explains why the rate of HB vaccination remains high until the age of 17. This illustrates a better immunization coverage against HB thanks to the campaign.

Figure 2a (resp. 2b) shows the MMR vaccination rate according to the age of the eldest child (resp. age of all children). Once again, there is a discontinuity around the threshold which follows the opposite direction to the one observed for HB. Below 11 years old, approximately 90% of children are vaccinated against MMR; this is the case of only 80% of children aged 11 and more. These figures may illustrate a negative spillover effect of the HB vaccination campaign on MMR vaccination.

The results of the econometric analysis presented in the next section evaluate the causal impacts of the HB vaccination campaign.

IV RESULTS

A Main results

Table 2 presents the results of the estimates of equation (1), using a linear function of age and a bandwidth of 5 years around the age of 11, i.e., estimates are performed for children aged 6 to 15 years old.[17]

1 Impact of the campaign on HB vaccination

We find a strong impact of the vaccination campaign on HB vaccination of children (see Table 2), both on the sample of the eldest child (column 1) and on the sample of all children (column 2). There is a strong increase in the immunization coverage due to the vaccination campaign: while 26% (resp. 28% on the larger sample) of children below 11 are HB vaccinated, this probability significantly increases, by 44 pp. for children above 11, concerned by the school vaccination campaign. Overall, this suggests that the policy was very effective at increasing vaccination against the targeted disease, as already shown in the literature: policies implemented at school, that recommend or mandate vaccinations are very effective at increasing vaccination rates (see, eg. Lawler, 2017; Carpenter and Lawler, 2019; Chang, 2016). While the campaign was effective, it can be noted that the immunization coverage is still below the 80% planned by the government: 70% of children above 11 are now HB vaccinated.

This result is robust regardless of the specification (local linear or local

[17]Full tables of results, that use different bandwidths, different local functions of age and include, or not, control variables, are presented in tables A17 to A24 in the Online Appendix. Control variables used for the estimates are the respondent's gender, age, level of education, profession, marital status and number of children.

Table 2: Local Linear RD estimates using a bandwidth of 5 years around the threshold of 11 years old

	HB outcomes	
	Eldest child HB vaccination (1)	All children HB vaccination (2)
$\mathbb{1}_{A_i \geq 11}$	0.44***	0.42***
se	(0.09)	(0.06)
N	394	717
Untreated Mean	0.26	0.28
	MMR outcomes	
	Eldest child MMR vaccination (1)	All children MMR vaccination (2)
$\mathbb{1}_{A_i \geq 11}$	-0.13*	-0.15***
se	(0.07)	(0.05)
N	394	717
Untreated Mean	0.90	0.90

Note: Standard errors in parentheses. ***Statistically significant at the 1% level; **Statistically significant at the 5% level; *Statistically significant at the 10% level. Results obtained for children aged between 6 and 15 years old. We control for linear trends of age, continuous at the age of 11.
Source: Health Barometer 1995.

linear spline), the bandwidth used, and the use of control variables (see Tables A17 to A20 in the Online Appendix).

2 Impact of the campaign on MMR vaccination

Our more striking and unexpected result is also reported in Table 2. While the literature usually finds positive effects of a vaccination campaign on other vaccines, we find a negative spillover effect on MMR. This result confirms the graphical evidence of Figure 2 and suggests a direct effect of the HB vaccination campaign on MMR vaccination (-13 pp for the sample composed of the eldest child only; -15 pp for the sample composed of all children) for a bandwidth of five years around the age threshold. The sign and magnitude of the coefficient are similar regardless of the specification, the bandwidth used, and the use of control variables (see Tables A21 to A24 in the Online Appendix).

How can we interpret this negative effect? Recall that these are not the same individuals on either side of the 11 years old threshold. Our data provide a snapshot of the vaccination coverage per age in 1995. This result highlights a difference in vaccination rates between two different groups (treated and untreated), exposed differently to the HB vaccination campaign. Therefore, it means that treated teenagers were less likely than untreated ones to get the MMR vaccination. As already mentioned, in the 1990s, the injection of the MMR vaccine was performed at any age between 1 and 18 years old, as well as during adulthood. Figure A2 shows that there was a continuous evolution of the vaccination coverage against measles across birth cohorts: at the age of 6, 60% of children born in 1984 (treated) were vaccinated against MMR; 80% of those born in 1987 (untreated) were. There is, therefore, a catch-up effect over time, due to the entry of MMR into the immunization schedule (1986), and the figure shows that there is no discontinuity in this catch-up. However, due to the HB campaign, this catch-up stopped for teenagers vaccinated against HB in 1995, explaining the 13 pp difference in vaccination rates against MMR between treated and untreated children.[18]

All these estimates are obtained without the use of control variables but we do not find any change in the impact of the campaign on HB and MMR vaccinations of children when they are included.[19]

B Robustness checks

This section focuses on checking the robustness of our main result: the lower probability of getting the MMR vaccine for children eligible to the HB vaccina-

[18]This lower vaccination rate for the treated group could result from a higher natural immunization against measles, without having to be vaccinated, due to an epidemic that the control group did not experience. Unfortunately, we cannot check this hypothesis as treated children in 1995 were born in 1984 and before, and data on measles incidence are only available from 1985 on. However, as observed in Figure A2, there is no discontinuity in the MMR vaccination across cohorts and therefore no evidence of a discontinuity in immunity.

[19]Note that we cannot test whether there is heterogeneity in the response to the campaign according to the sex of the child, as this variable is not available. However, we tested whether there is a heterogeneity of the effect across regions as (unobserved) regional characteristics may affect the evaluation. For example, the results could be driven by a specific region that has a particularly high HB disease incidence and/or a very low MMR incidence for example. Results are presented in the "Robustness checks" section in the Online Appendix. There is no evidence of heterogeneity of the impact between regions, which seems to indicate that the impact of the campaign is the same throughout the country and is not driven by any specific region.

Table 3: Local Linear RD estimates using a bandwidth of 5 years around the threshold of 11 years old

	MMR parental beliefs	
	MMR is benign (1)	Non MMR vaccination is risky (2)
$\mathbb{1}_{A_i \geq 11}$	0.21**	-0.20**
se	(0.10)	(0.10)
N	388	392
Untreated Mean	0.21	0.80

Note: Standard errors in parentheses. ***Statistically significant at the 1% level; **Statistically significant at the 5% level; *Statistically significant at the 10% level. Results obtained for children aged between 6 and 15 years old, on the sample composed of the eldest child only. We control for linear trends of age, continuous at the age of 11.
Source: Health Barometer 1995.

tion campaign.

1 Consistency with parents' beliefs on MMR

Two other variables in the database comfort this result: the probability of believing that no MMR vaccination is risky and the probability of believing that MMR is benign.[20] Table 3 shows that the negative impact of the campaign on MMR vaccination rate is fully consistent with the fact that treated parents are more likely to report that MMR is benign (+21 pp) and less likely to believe that the non-vaccination for MMR is risky (-20 pp). These differences in beliefs may explain the lower probability for treated children to be vaccinated against MMR. These results are virtually the same whatever the specification and the bandwidths used (see Tables A29 and A30 in the Online Appendix).

2 Use of other specifications

We check the robustness of our results to: i) the use of other bandwidths; ii) the use of another specification of the distance to the cut-off; and iii) the exclusion of children partially treated.

[20] Questions were "Do you think MMR is a benign illness?" (yes=1; no=0) and "Do you think not vaccinating your child against MMR is risky" (yes=1; no=0).

Table 4: Local Linear RD estimates using a bandwidth of 5 years around the threshold of 11 years old on restricted samples

	HB outcomes		
	Without the 10 y.o children (1)	Without the 11 y.o children (2)	Without the 10 & 11 y.o children (3)
$\mathbb{1}_{A_i \geq 11}$	0.40***	0.47***	0.45***
se	(0.09)	(0.08)	(0.10)
N	635	637	555
Untreated Mean	0.31	0.28	0.31

	MMR outcomes		
	Without the 10 y.o children (1)	Without the 11 y.o children (2)	Without the 10 & 11 y.o children (3)
$\mathbb{1}_{A_i \geq 11}$	-0.21***	-0.18**	-0.24***
se	(0.07)	(0.07)	(0.08)
N	635	637	555
Untreated Mean	0.96	0.90	0.96

Note: Standard errors in parentheses. ***Statistically significant at the 1% level; **Statistically significant at the 5% level; *Statistically significant at the 10% level. Results obtained for children aged between 6 and 15 years old, on the sample composed of all children. We control for linear trends of age, continuous at the age of 11
Source: Health Barometer 1995.

First, our main results are obtained using a bandwidth of five years around the age threshold. Tables A17 to A26 in the Online Appendix provide estimates using bandwidths of 2 to 6 years around the 11 years old threshold. Our main results are virtually the same.

Second, we use an alternative specification of the distance to the cut-off ($f(A_i - 11)$ in equation (1)): a local linear spline function of age. Results are similar (see Tables A19, A20, A23 and A24). We observe the same negative effect on vaccination against MMR of a similar order.

Third, as the age of the child is not the exact variable determining treatment we use a donut specification. We exclude children who are partially treated, i.e., children of 10 years old (who are always considered as untreated in our main analysis, although some of them could already be treated if they skipped a year), or children of 11 years old (who are always considered as treated in our main analysis, although some of them could be untreated if they repeated a year before entering middle school), or both. Results are presented in Table 4. The results on MMR vaccination are similar, with an effect between -18 and -24 pp.

3 Placebo tests

We perform 2 different types of placebo tests. First, we use the 1992 and 2000 Health Barometer data to check two hypotheses: i) is this discontinuity in the MMR vaccination rate an "age effect", i.e., is such a discontinuity usually found at the age of 11?; and ii) is this discontinuity a "cohort effect", i.e., is it specific to the cohort of individuals born in 1984 (aged 11 and more in 1995)? Unfortunately, the 1992 and 2000 Health Barometers do not contain any questions on HB vaccination; MMR vaccination for children is the only common variable between the different datasets. Our robustness analysis can only be performed on this outcome.[21]

First, we test for the existence of an age effect, i.e., a discontinuity in the

[21] As in the main analysis, we only selected households composed of at least one child. We kept information about all children of the household in order to maximize sample size, especially for the 1992 data where the number of observations is small.

MMR vaccination rate at the age of 11 in 1992. Indeed, the discontinuity observed at the age of 11 in 1995 could result from an "entry into middle school" effect more than an effect of the campaign.[22] The MMR vaccination rate is continuous at the age of 11 in 1992 (see the top of Table 5, column 1 and Table A31 in the Online Appendix). The use of the Health Barometer 2000 confirms that the MMR vaccination rate is continuous at the age of 11 (see the top of Table 5, column 2 and Table A32 in the Online Appendix for more details). Consequently, the age of 11 does not correspond to a specific age at which parents decide to vaccinate their children less against MMR. The shock observed in the 1995 database, therefore, does not reflect an age effect, it is exogenous and due to the vaccination campaign. Note that we cannot use the 2000 Health Barometer database to analyze the long-term behaviour of pupils who were affected by the 1995 vaccination campaign. Those children, born in 1984, were 16 in 2000 and the question on MMR vaccination was only asked for children aged 15 and less.

Second, the discontinuity at the age of 11 in 1995 could result from a cohort effect. As the 1995 Health Barometer is a cross-section, the age effect (discontinuity at the age of 11 in 1995) cannot be distinguished from the cohort effect (discontinuity for children born in 1984). We, therefore, test whether there is a discontinuity at the age of 8 in 1992, i.e., a discontinuity between children aged 8 and more in 1992 (i.e., born in 1984 or before) and children below 7 in 1992 (i.e., born after 1985). We find no significant decrease in MMR vaccination rate (see bottom of Table 5 and Table A33 in the Online Appendix). The vaccination rate is the same around the 8-year-old threshold. Therefore, our estimated effect in 1995 cannot be attributed to a cohort effect.

A second Placebo test consists in running the regressions on MMR vaccination rates using placebo cut-offs, ie. cutoffs at ages 7 to 14 years old, as suggested by Barreca et al. (2016) (see Figure A34 in the Online Appendix). Results are very reassuring: the negative impact of the campaign on MMR vaccination rates

[22]Note that there is no other reform in the healthcare sector during this period, which could explain the decrease in MMR vaccination at the age of 11.

Table 5: Placebo tests: Local Linear RD estimates for MMR vaccination using 1992 and 2000 Health Barometers (Bandwidth=5)

Vaccination	All children MMR vaccination 1992 Health Barometer (1)	All children MMR vaccination 2000 Health Barometer (2)
	Threshold at 11 years old	
$\mathbb{1}_{A_i \geq 11}$	0.13	-0.01
s.e.	(0.09)	(0.02)
N	407	3 866
Untreated Mean	0.79	0.93
	Threshold at 8 years old	
$\mathbb{1}_{A_i \geq 8}$	-0,07	
s.e.	(0,07)	
N	513	
Untreated Mean	0.85	

Note: Standard errors in parentheses. ***Statistically significant at the 1% level; **Statistically significant at the 5% level; *Statistically significant at the 10% level. Results obtained with a bandwidth of 5 years around 11 (top of the Table) or 8 (bottom of the Table). We control for linear trends of age, continuous at the age of 11: $(A_i - 11)\mathbb{1}_{A_i \geq 11}$ and $(A_i - 11)\mathbb{1}_{A_i < 11}$;
Source: Health Barometer 1992 and 2000.

is only observed at the cut-off of 11 years old, and at no other cut-offs.

C Mechanisms

In this section, we investigate the potential mechanisms that may lead to the negative spillover effect of the campaign on MMR vaccination rates. First, we check more formally for the existence of a spillover effect of HB vaccination on MMR vaccination. Then, several potential mechanisms are put forward to explain this crowding-out effect.

1 Is there a crowding-out effect of HB vaccination on MMR vaccination?

The campaign led to a decrease in MMR vaccination for targeted pupils. However, one may wonder whether these are the same parents who increase HB because of the campaign and also stop vaccinating their children against the MMR. To check whether there is a crowding-out effect of HB vaccination on MMR vaccination take-up, we use a procedure equivalent to a fuzzy regression discontinuity (FRD) design. We exploit the discontinuity in the HB vaccination rate to estimate the causal effect of HB vaccination uptake on MMR vaccination behavior. Using such strategy, we assume that the age threshold of 11 has no direct impact on MMR vaccination other than through the variation in HB vaccination rates. This exclusion restriction is likely to be valid, given that Placebo tests using the 1992 and 2000 Health Barometers confirm that there is no discontinuity in the MMR vaccination rate at age 11. This FRD design is not used in the main analysis as it imposes that changes in MMR vaccination only result from variations in HB vaccination. However, this hypothesis is restrictive: it omits that behaviour towards MMR vaccination could be influenced by the information campaign in itself, that changed parents beliefs about vaccination (see Table 3 for example). In this section, this kind of FRD design enables testing more formally than with the reduced form, the existence of a crowding-out effect: we estimate the impact of HB vaccination on MMR vaccination, for teenagers who were vaccinated against HB at the 11 age threshold, but would not have been otherwise (the compliers).

Table 6 shows a strong impact of the increase in HB vaccination on MMR vaccination for the compliers. The MMR vaccination decreases by 31 pp. on the sample of the eldest child and 35 pp. on the sample of all children. More precisely, children who were vaccinated against HB because of the campaign are 31 to 35 pp less likely to get vaccinated against the MMR.[23] These results are robust to the use of other bandwidths and to the inclusion of control variables (see Tables A35 and A36 in the Online Appendix). Therefore, approximately 30 percent of the compliers are not vaccinated against the MMR diseases because they got vaccinated against HB. This result confirms the existence of a crowding-out effect of the campaign on MMR vaccination at least for part of the children.

[23]Note that the estimated coefficient of the fuzzy design is equal to the coefficient of the reduced form over the coefficient of the first stage (e.g. $-0.13/0.44 = -0.3$, see Table 2).

Table 6: Local Linear Fuzzy RD estimates using a bandwidth of 5 years around the threshold of 11 years old

	MMR outcomes	
	Eldest child MMR vaccination (1)	All children MMR vaccination (2)
HB Vacc.	-0.31*	-0.35**
se	(0.17)	(0.14)
F-stat	22.524	41.906
N	394	717

Note: Standard errors in parentheses. ***Statistically significant at the 1% level; **Statistically significant at the 5% level; *Statistically significant at the 10% level. Results obtained for children aged between 6 and 15 years old. We control for linear trends of age, continuous at the age of 11.
Source: Health Barometer 1995.

2 Potential mechanisms that explain the spillover effects between both vaccines

The negative spillover effect on MMR vaccination rates could be the result of the relative price variation between the two vaccines, i.e. a price effect. The relative cost of the MMR vaccine (the price of the vaccine and of the consultation) increased with the campaign, compared to the cost of the HB vaccine (becoming €0). To test this hypothesis, we divided our sample according to the income level of the household. Using the FRD strategy presented in Section IV-C-1, we find that the spillover effect is higher for wealthier individuals: the MMR vaccination decreases, significant at the 5% level, while the effect is non-significant for low-income individuals (see Table A37 in the Online Appendix). Thus, the effect seems driven by the wealthier individuals which contradicts the assumption of a price effect for less wealthier individuals.

The crowding-out effect may also result from an over-vaccination effect. Treated parents may be reluctant to administer both vaccines to their children in the same year, taking the three HB injections already administrated into account. They might also be concerned with the possibility that the MMR vaccine could interfere with the HB one, about the safety of giving MMR shortly after the HB vaccine, or about the additional pain or undesired side-effect (headaches, fever, ...) that another vaccine would cause. However, this "over-vaccination" mechanism is not testable using our data.

It may also be the consequence of medical advice. Parents' attitudes could be driven by physicians' beliefs and practices. We analyze the role of general practitioners during the campaign using the 1994 Physicians Barometer, which contains information on physicians' beliefs about the target population for HB and MMR vaccines.[24] 17.5% of the physicians were very favorable to the HB vaccination for newborns and 85% for teenagers (Table A38 in the Online Appendix). Physicians were thus focused on HB vaccination for teenagers. On the contrary, they favored MMR vaccination for newborns: 83% of them systematically proposed the MMR vaccine to newborns while only 59% proposed it to children aged 2-16. These proportions vary slightly according to physicians' characteristics. Those with a very high proportion of young patients and younger physicians propose vaccination more often. For example, physicians for whom children below age 15 represent 50 to 75% of their patients propose HB vaccination to 96% of their teenage patients. On the contrary, they recommend MMR vaccination to 92% of their newborn patients but to only 76% of their teenage patients. Overall, and whatever their characteristics, doctors could have focused parents' attention on the necessity for pupils to be HB vaccinated and omitted to advise them about the need for their child to get vaccinated against MMR.

Finally, and given the consistency of our results with parents' beliefs on MMR (they are more likely to report that MMR is benign and less likely to believe that the non-vaccination for MMR is risky), the result obtained on MMR may be interpreted as the existence of a "salience effect" on the targeted vaccine: individuals focused their attention on HB vaccination, neglecting the risk of MMR for their children. Part of this salience effect may be driven by physicians.

Following Taylor and Thompson (1982), "salience refers to the phenomenon

[24] Unfortunately, this is the only wave of the Physicians Barometer; we cannot check whether the campaign changed their opinion over the years, concerning the population targeted by each vaccine.

that when one's attention is differentially directed to one portion of the environment rather than to others, the information contained in that portion will receive disproportionate weighting in subsequent judgments". This salience effect theory has also been investigated in economics, and introduced into theoretical models that explain individuals' consumption choices (see for example Bordalo et al., 2012 and Bordalo et al., 2013). This is also one interpretation given by Bouckaert et al. (2020) to explain the asymmetric spillovers between partners and between parents and children for flu vaccination. In our case, because the MMR vaccine was recommended, but not mandatory, parents may have believed that MMR vaccination was not as essential as HB vaccination. If MMR vaccination was so important, there would have been more information on it and a free vaccination campaign.

The way the campaign was implemented may be one vector of this salience effect. First, at that time, the media were focused on HB. Using data from the National Audiovisual Institute, we compared the coverage of HB and measles in TV shows, between 01/06/1994 (announcement of the campaign) and 30/06/1995 (end of the first school year in which the campaign was implemented). We found 183 TV shows about HB and only 12 about measles.

Second, the salience effect could result from the way politicians disseminated the information during the communication campaign. As noted by Nauche (2001), the campaign was characterized by the desire to scare people about the risks of contracting HB. For example, official campaign documents mentioned 2 million deaths per year from HB while the WHO estimated this figure at 1 million. Incidence was also over-estimated: 30,000 to 100,000 new cases, while the French National Public Health Agency estimated this number at 8,000 in 1994. Moreover, the number of chronic HB carriers tripled (from 100,000 to 300,000). Nauche (2001) also mentions that the "pharmaceutical industry contributed to the alarming tenor of the messages that were disseminated: an internal document from a pharmaceutical laboratory stresses that it is necessary to dramatize with adolescents the danger and the risk incurred in not being vaccinated and to make vaccination an initiatory rite of passage to adulthood".

Third, this salience effect could result from all the contradictory debates about the modes of transmission of the disease, with the question of saliva as a possible vector of transmission of the disease being at the heart of the debates. In the campaign presentation document, the Ministry of Health mentioned that saliva may be a mode of transmission, but that scientific research was in progress. This information was quickly distorted, and many brochures and radio programs directed at young people claimed that saliva - and therefore kissing - was a mode of transmission, leading parents to overestimate the risks that their teenager contract the disease. Overall, the communication campaign, and the misinformation about the prevalence of the disease and the modes of transmission may have led parents to overestimate the dangers of this disease for their children and the need to vaccinate them. No such debates and communication on the MMR existed at that time.

V DISCUSSION AND CONCLUSION

In this paper, we measure the causal effect of the HB vaccination campaign on HB vaccination for pupils aged 11 and more, as well as on MMR vaccination. The estimates reveal a strong impact of the campaign on children's vaccination rates. It leads to a 42 to 44 pp increase in the probability of being HB vaccinated, a result that is consistent with the literature, that shows that policies implemented at school are very effective at increasing vaccination rates. We also find a strong negative and unexpected effect of this campaign on MMR vaccination rates. The MMR vaccination rates are 13 to 15 pp lower among the targeted pupils. This negative impact on MMR is consistent with estimates obtained on parents' beliefs about MMR vaccination. Moreover, this result cannot be attributed to an age or a cohort effect. Our robustness checks confirm that this decrease is a causal effect of the HB vaccination campaign.

This change in behaviour could result from a salience effect - possibly driven by physicians, which may concern information transmission. Individuals with a child older than 11 focused their attention on the information provided on HB vaccination. They may have perceived the MMR vaccine as less essential than the HB vaccine. The MMR vaccine was recommended but not mandatory, was not free, and no vaccination campaign had been implemented. Consequently, they neglected the risk of MMR for their children. Overall, the focus on HB vaccination may have led to a decrease in vaccination for non-mandatory vaccines and to a decrease in the belief that the other vaccines were as important. While previous results in the literature suggest that vaccination campaigns generate positive spillovers on untargeted vaccines with a salience effect on vaccination at large (see eg., Carpenter and Lawler, 2019; Churchill, 2021), our results suggest that a salience effect on one vaccine can also generate a negative spillover effect on untargeted vaccines. This original result is of interest and may come from the specific design of this HB vaccination policy. Our paper more generally relates to the literature on potential unexpected effects of policies on vaccination behaviour (see, eg., Hirani, 2021; Bouckaert et al., 2020), health interventions (see, e.g., Abouk et al., 2023; DiNardo and Lemieux, 2001; Douven et al., 2015; Kim, 2021) or public policy campaigns as a whole (see, e.g., Chuan et al., 2021; Busch et al., 2014; Gregory and Zierahn, 2022; Cheshire et al., 2018).

Unfortunately, our data (neither the 1995 nor the 2000 Health Barometers) do not enable us to investigate whether this negative spillover effect of the campaign on MMR vaccination rates is temporary or permanent, and thus, to formally test for a potential postponing vaccination effect the following years. Moreover, aggregated data on MMR immunization rates by age and year do not exist to enable further investigation. Another limitation is that our data do not allow us to distinguish whether the salience effect comes from the individuals themselves or from their GPs' advice. Depending on the mechanism, the public policy implications would be very different.

The negative effect on MMR vaccination was relatively unexpected and may imply a negative externality, at the very least, short-term costs, as measles is an

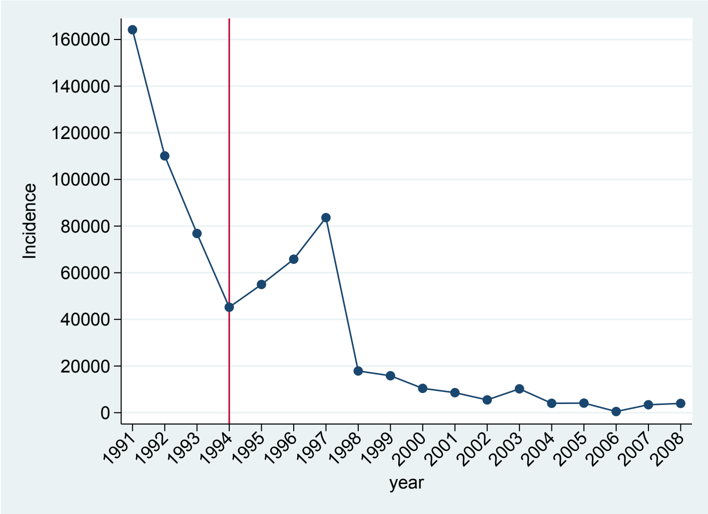


Figure 3: Evolution of measles incidence (*Réseau Sentinelles*)

extremely contagious and potentially dangerous disease.[25] A decline in vaccine coverage would lead to increasingly large outbreaks of measles, and finally, the recrudescence of measles as an endemic disease (Jansen et al., 2003). If the vaccination rate falls, the disease will spread further, raising the question of the net effect of the HB vaccination campaign on the well-being of the population. Without any causal interpretation, Figure 3, built using data from the public health agency, shows a worrying increase in the incidence of measles between 1994 and 1997 in France, which may have been the result of the decrease in MMR vaccination observed around the years of the HB campaign. The decrease in the incidence of measles as soon as the campaign ended, however, suggests only a short-run effect of the HB vaccination campaign on MMR vaccination rates. Moreover, vaccination against measles kept increasing after the campaign; in 2022, 95% of the French population is vaccinated against it.

To conclude, our results suggest that implementing a campaign for a package of vaccines, rather than a specific one, may be a good option to avoid salience effects, as was the case in France in 2018 to promote a package of 11 vaccines. This was also the case in 2022 when individuals aged 65 and more were systematically proposed a package of COVID-19 and flu vaccination. Overall, it also

[25]With a vaccination coverage exceeding 95%, measles would be eradicated (Christie and Gay, 2011).

shows both the necessity and the difficulty of evaluating the effects of a public policy as a whole, taking into account all unexpected adverse effects.

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Online Appendix

for

Direct and Crowding-out Effects of a Hepatitis B Vaccination Campaign

Contents

I The vaccination schedule in France

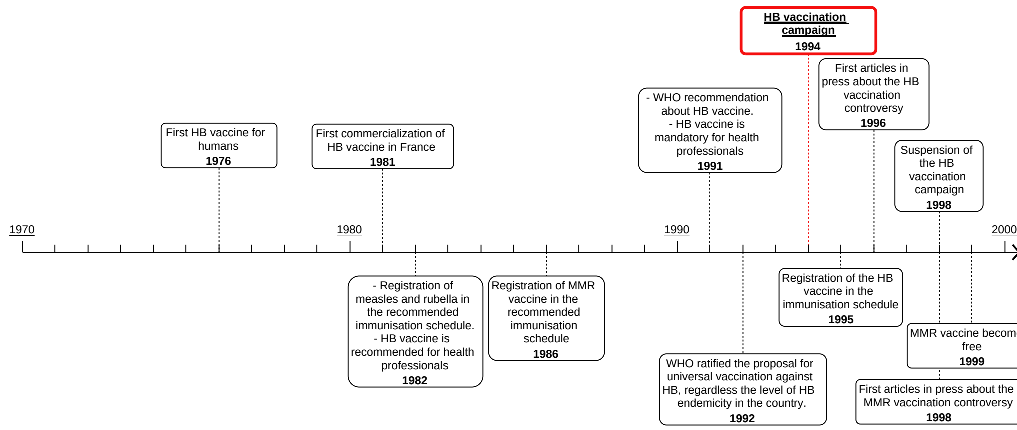


Figure A1. Chronological overview of vaccination policies regarding MMR and HB in France

II The MMR vaccination coverage

The MMR vaccination increases progressively per cohort (see Figures A2 and A3).
Note that the spirit of the Figure A3 is very different from the figures that present the MMR vaccination per age in the paper (Figures 2a and 2b). Figures 2a and 2b present a snapshot of vaccination coverage per age in 1995, meaning that the individuals are not the same on each side of the age threshold, however, they are comparable in terms of observable and unobservable characteristics (see Section IV of the Online Appendix). Our Figures 2a and 2b show a difference in vaccination rates between two different groups (treated and untreated), exposed differently to the hepatitis B vaccination campaign. Thus, this is not the evolution of the vaccination coverage per cohort at a given age, in contrast to Figure A3. Convergence towards 80% rates was slower for the older cohorts, as they were less likely vaccinated than the younger ones between 1 and 2 yo (see Figures A2 and A3). Consistently with Figure 2b in our paper, the vaccination coverage is approximately 80%–90% at 6–7 yo (age in 1995) for cohorts 1988-1989; and 80%–90% at 4–5 yo (age in 1995) for cohorts 1990-1991 (see Figure A3).

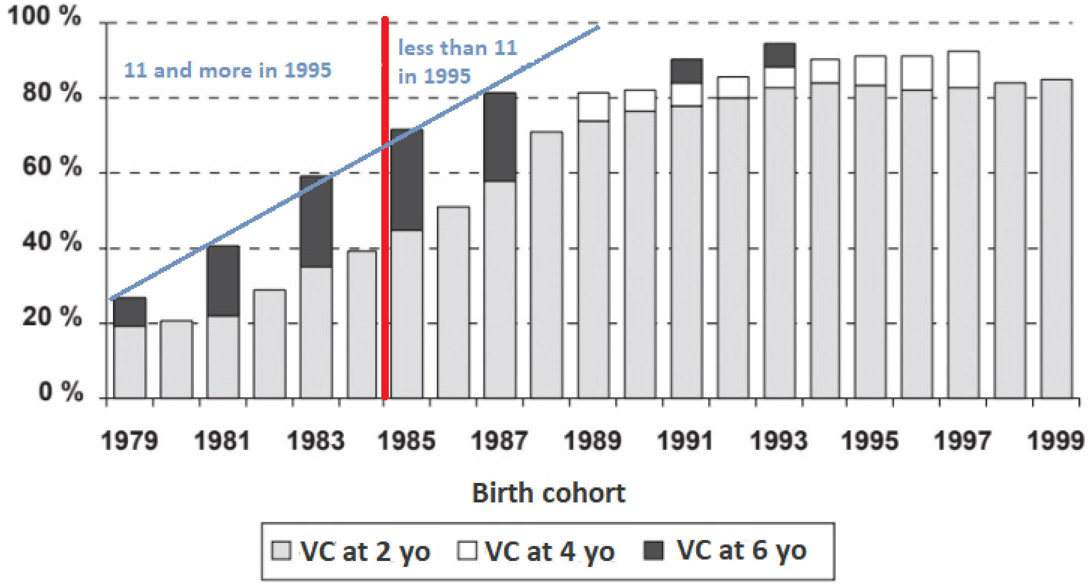


Figure A2. Vaccination coverage against ROR1 (first injection) by birth cohort

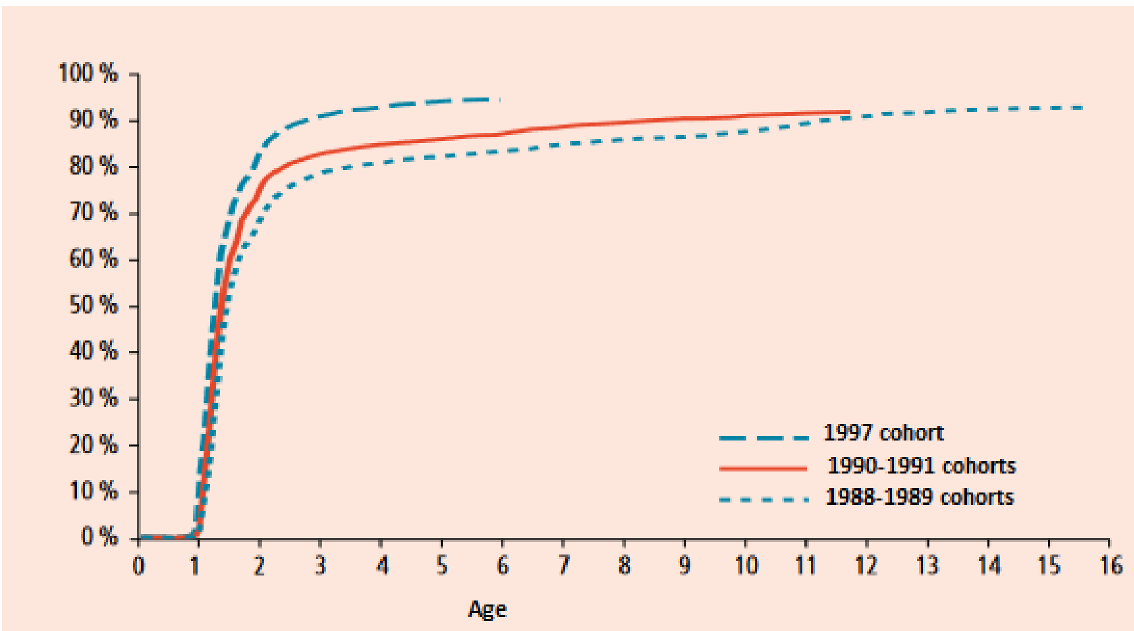


Figure A3. Cumulative coverage for MMR1 (first injection) per age at vaccination by children's cohort surveyed, France, 2001-2004 (Antona et al. 2007)

III The Data

This paper uses data from the 1995–1996 Adults' Health Barometer. The sample contains 1,993 individuals aged between 18 and 75 - a sample of about 1/20,000. The data were collected from 20th November to 22nd December 1995.

A Data collection

The survey was conducted via the computed-assisted telephone interviewing (CATI) system. Using a random file of 4,116 households provided by the French telecommunications company (France Télécom), the interviewers selected individuals on the basis of three criteria, in order to ensure that the selection of the interviewees was as close as possible to random. First, the household had to be composed of at least one individual, aged between 18 and 75 and who spoke French. The residence contacted had to be the household's primary residence. Second, the respondent in each home was selected via the next birthday method. Solely this person (present or absent when the first contact is made) had to be questioned. Third, in order to reach the largest possible number of households and individuals, each number was called a maximum of ten times, at different times and on different days. Breaks in the interviewing process were allowed for personal reasons or if the respondent did not feel comfortable answering in the presence of another person, in which case an appointment was made with the respondent and the interview resumed at the question where it was broken off.

B Fieldwork report

The time per questionnaire was approximately 25 minutes on average. Out of the 4,116 numbers drawn at random, 2.3% were off target (wrong numbers and business), 1.6% were outside the field (no one of between 18 and 75 years old in the household, second homes and non-French speaking) and 11.4% proved unreachable. Among the remaining "eligible households" (ie. 3,484 households), the household total rate of refusal to take part in the survey was 16.1%, hence a sample of 2,924 eligible individuals/households. Finally, together with the individual rate of abandonment during the interview, the final sample contains 1,993 individuals.

C Representativeness of the sample

Overall, the sample composed of 1,993 individuals is representative of the French population in 1995, in terms of age, gender and region of residence, as shown in Table A4. Note that this table presents weighted and unweighted proportions. However, our econometric analysis cannot use the weights. In fact, these weights are defined such that the *individuals* surveyed are representative of the French population, while our analysis is at the *child* level. Therefore, we would need to use weights specific to the children population, that are not available.

We therefore also checked that the sample of children used for the empirical analysis has an age distribution similar to the French population, which is the case (see Table A5).

Table A4. Comparison of the distribution of the population per gender, region of residence and age, in the sample and in the French population

	1995 Health Barometer				French population in 1995	
	Weighted Proportions		Non-Weighted Proportions			
	Freq.	Percent	Freq.	Percent	Freq.	Percent
Gender						
men	972,568	48.79	862	43.25	28,078,056	48.62
women	1,020,925	51.21	1,131	56.75	29,674,479	51.38
Regions						
Paris	355,191	17.82	342	17.16	10,858,975	18.89
West	261,558	13.12	311	15.60	7,605,721	13.23
East	177,362	8.90	208	10.44	5,114,503	8.90
North-West	218,974	10.98	197	9.88	5,597,665	9.74
North-East	165,396	8.30	167	8.38	4,811,773	8.37
South-West	213,219	10.70	222	11.14	6,067,468	10.55
South	229,161	11.50	181	9.08	6,614,346	11.50
Center-East	237,137	11.90	238	11.94	6,837,322	11.89
North	135,495	6.80	127	6.37	3,986,346	6.93
Age						
18-39 y.o.	965,480	48.43	983	49.32	17,108,296	43.72
40-59 y.o.	647,094	32.46	619	31.06	13,960,425	35.67
60-75 y.o.	380,919	19.11	391	19.62	8,063,934	20.61
Total	1,993,493	100	1,993	100	57,494,119	100

Note: Using the classification of French regions that prevailed in 1995, the PARIS region includes only region Ile-de-France; the WEST region includes regions Bretagne, Pays de la Loire and Poitou-Charentes; the EAST region includes regions Alsace, Franche-Comté and Lorraine; the NORTH-WEST region includes regions Basse-Normandie, Haute-Normandie and Centre; the NORTH-EAST region includes regions Bourgogne, Champagne-Ardennes and Picardie; the SOUTH-WEST region includes regions Aquitaine, Limousin and Midi-Pyrénées; the SOUTH region includes regions Corse, Languedoc-Roussillon and Provence-Alpes-Cote-d'Azur; the region CENTER-EAST includes regions Auvergne and Rhône-Alpes and the region NORTH only includes region Nord-Pas-de-Calais
Source: Health Barometer 1995 and The National Institute of Statistics and Economic Studies data ("séries longues").

Table A5. Comparison of the distribution of the children per age groups, in the sample and in the French population

	1995 Health Barometer 0-17 y.o.		Children population in 1995 0-17 y.o.	
	Freq.	Percent	Freq.	Percent
Age				
0-2 y.o.	225	0.16	2 203 995	0.16
3-5 y.o.	235	0.17	2 333 884	0.15
6-8 y.o.	233	0.17	2 382 347	0.17
9-11 y.o.	243	0.18	2 348 474	0.17
12-14 y.o.	203	0.15	2 487 331	0.18
15-17 y.o.	231	0.17	2 353 979	0.17
Total	1,370	100	14 110 010	100

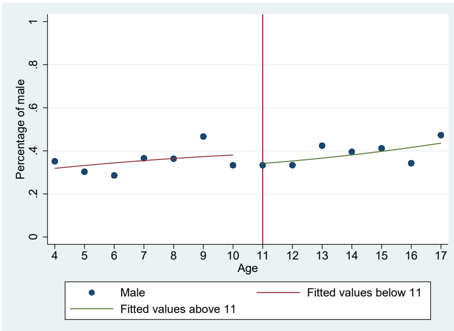
Source: Health Barometer 1995 and The National Institute of Statistics and Economic Studies data ("séries longues").

IV Continuity of the characteristics at the age of 11

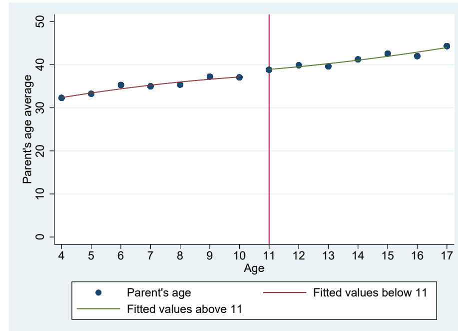
The regression discontinuity design enables for the measurement of the effects of the French vaccination program under the assumption that individuals on both sides of the discontinuity age threshold do not differ in any other observable or unobservable characteristics. Our identifying assumption is that vaccination rates would be continuous at the age threshold (11 years old) in the absence of changes in vaccination incentives. The vaccination decision for a child may be influenced by various parental characteristics (such as sex, education, profession, etc.), however, we check in this section that the proportion of these factors does not change discontinuously at the age threshold.

Figure A6 presents the parental characteristics on the y-axis and the age of the child on the x-axis. Tables A7 to A15 confirm that the parental characteristics are continuous at the age threshold (proportion of men, age, education, profession, marital status, number of children in the household). Figure A16 presents evidence that the proportion of individuals is continuous at the age threshold (following McCrary, 2008).

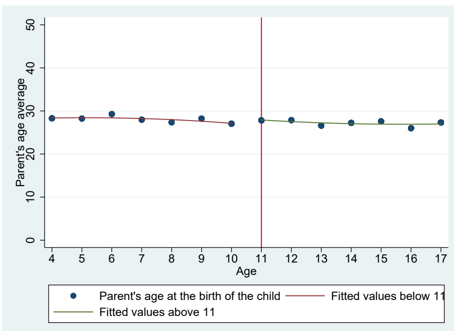
A Graphical evidence



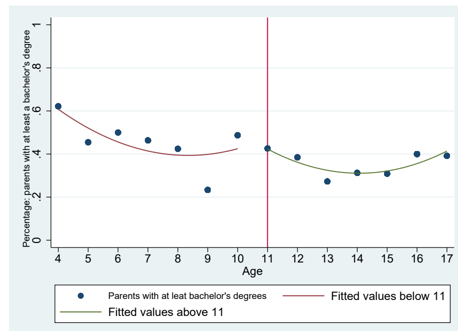
(a) % of head of household who are men



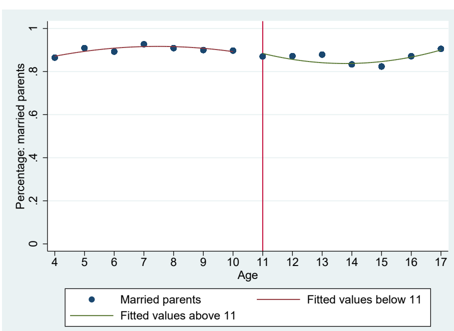
(b) Average age of the head of household



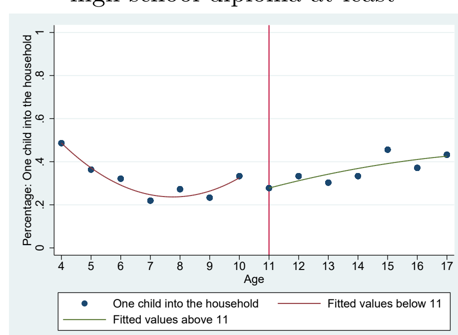
(c) Average age of the head of household at child birth



(d) % of head of household who hold a high school diploma at least



(e) % of married couples



(f) % of households with at least one child

Figure A6. Socio-demographic characteristics of the household

B Estimates: differences in individual characteristics at the 11 yo threshold

Table A7. Continuity in the characteristics: Regression Discontinuity with y=father

	All	Bandwidth=4	Bandwidth=5	Bandwidth=6
	(1)	(2)	(3)	(4)
	Dependent variable: father			
	b/se	b/se	b/se	b/se
	Linear			
$\mathbb{1}_{A_i \geq 11}$	0.030	-0.059	-0.089	-0.070
	(0.077)	(0.112)	(0.100)	(0.093)
$\mathbb{1}_{A_i<11}(A_i - 11)$	-0.012	0.006	0.029	0.021
	(0.009)	(0.035)	(0.025)	(0.020)
$\mathbb{1}_{A_i \geq 11}(A_i - 11)$	0.015	0.032	0.015	0.015
	(0.020)	(0.031)	(0.020)	(0.020)
R^2	0.004	0.003	0.005	0.005
AIC	779.440	424.718	539.464	578.076
	Linear Spline			
$\mathbb{1}_{A_i \geq 11}$	-0.097	-0.004	-0.025	-0.046
	(0.126)	(0.156)	(0.130)	(0.129)
LS1	0.032	0.056	0.032	0.032
	(0.031)	(0.053)	(0.031)	(0.031)
LS2	-0.042	-0.025	-0.042	-0.042
	(0.088)	(0.107)	(0.088)	(0.088)
LS3	0.041	-0.044	-0.016	-0.000
	(0.046)	(0.086)	(0.054)	(0.051)
LS4	-0.022*	0.057	0.082	0.035
	(0.013)	(0.088)	(0.057)	(0.036)
R^2	0.007	0.006	0.009	0.007
AIC	781.627	427.977	542.041	581.395
N	564	306	394	424

Note: Standard errors in parentheses. ***Statistically significant at the 1% level; **significant at the 5% level; *significant at the 10% level. Regressions are performed without any control variable. The first column reports estimates obtained on the whole sample. Column 2 reports estimates obtained using households whose eldest child is between 7 and 14 years old (bandwidth of 4). Respectively, columns 3 and 4 report the results for households whose eldest child is between 6 and 15 years old (bandwidth of 5) or between 5 and 16 years old (bandwidth of 6). For the linear spline specification, the variables are defined as follows: $LS1 = \mathbb{1}_{A_i \geq 11}[(A_i - 11)((A_i - 11) < c) + c((A_i - 11) \geq c)]$; $LS2 = ((A_i - 11) \geq 0)(A_i - 11 - c)$; $LS3 = \mathbb{1}_{A_i<11}[(A_i - 11)(A_i - 11 \geq -c) - c((A_i - 11) < -c)]$; $LS4 = ((A_i - 11) < -c)(A_i - 11 + c)$, with c=3 for the whole sample and bandwidths of 5 and 6, c=2 for bandwidth of 4, due to a smaller sample size. $AIC = N \ln(\widehat{\sigma}^2_\epsilon) + 2p$
Source: Health Barometer 1995.

Table A8. Continuity in the characteristics: Regression Discontinuity with y=age of the head of household

	All	Bandwidth=4	Bandwidth=5	Bandwidth=6
	(1)	(2)	(3)	(4)
	Dependent variable: age of the head of household			
	b/se	b/se	b/se	b/se
	Linear			
$\mathbb{1}_{A_i \geq 11}$	0.463	0.859	1.145	0.796
	(0.978)	(1.455)	(1.336)	(1.180)
$\mathbb{1}_{A_i < 11}(A_i - 11)$	0.879***	0.849*	0.592	0.747***
	(0.104)	(0.435)	(0.366)	(0.244)
$\mathbb{1}_{A_i \geq 11}(A_i - 11)$	0.933***	0.683	0.933***	0.933***
	(0.254)	(0.443)	(0.254)	(0.254)
R^2	0.340	0.108	0.158	0.193
AIC	3600.906	1996.342	2559.727	2739.966
	Linear Spline			
$\mathbb{1}_{A_i \geq 11}$	0.835	1.106	0.386	0.689
	(1.643)	(2.008)	(1.696)	(1.675)
LS1	0.683	0.406	0.683	0.683
	(0.443)	(0.720)	(0.444)	(0.443)
LS2	1.820	1.326	1.820	1.820
	(1.139)	(1.518)	(1.142)	(1.141)
LS3	0.808	0.711	1.163*	0.923
	(0.585)	(1.041)	(0.663)	(0.632)
LS4	0.893***	0.566	-0.074	0.631
	(0.137)	(1.040)	(0.816)	(0.397)
R^2	0.341	0.109	0.161	0.194
AIC	3604.143	1999.718	2562.171	2743.185
N	564	306	394	424

Note: Standard errors in parentheses. ***Statistically significant at the 1% level; **significant at the 5% level; *significant at the 10% level. Regressions are performed without any control variable. The first column reports estimates obtained on the whole sample. Column 2 reports estimates obtained using households whose eldest child is between 7 and 14 years old (bandwidth of 4). Respectively, columns 3 and 4 report the results for households whose eldest child is between 6 and 15 years old (bandwidth of 5) or between 5 and 16 years old (bandwidth of 6). For the linear spline specification, the variables are defined as follows: $LS1 = \mathbb{1}_{A_i \geq 11}[(A_i - 11)((A_i - 11) < c) + c((A_i - 11) \geq c)]$; $LS2 = ((A_i - 11) \geq 0)(A_i - 11 - c)$; $LS3 = \mathbb{1}_{A_i < 11}[(A_i - 11)(A_i - 11 \geq -c) - c((A_i - 11) < -c)]$; $LS4 = ((A_i - 11) < -c)(A_i - 11 + c)$, with c=3 for the whole sample and bandwidths of 5 and 6, c=2 for bandwidth of 4, due to a smaller sample size. $AIC = N \ln(\widehat{\sigma}_\epsilon^2) + 2p$
Source: Health Barometer 1995.

Table A9. Continuity in the characteristics: Regression Discontinuity with y=high school diploma or more

	All	Bandwidth=4	Bandwidth=5	Bandwidth=6
	(1)	(2)	(3)	(4)
	Dependent variable: high school diploma or more			
	b/se	b/se	b/se	b/se
	Linear			
$\mathbb{1}_{A_i \geq 11}$	-0.008	0.025	0.025	0.034
	(0.080)	(0.117)	(0.106)	(0.097)
$\mathbb{1}_{A_i<11}(A_i-11)$	-0.007	-0.006	-0.013	-0.017
	(0.009)	(0.037)	(0.028)	(0.021)
$\mathbb{1}_{A_i \geq 11}(A_i-11)$	-0.031	-0.048	-0.031	-0.031
	(0.021)	(0.032)	(0.021)	(0.021)
R^2	0.016	0.011	0.012	0.015
AIC	800.815	433.387	552.924	596.590
	Linear Spline			
$\mathbb{1}_{A_i \geq 11}$	0.024	-0.121	-0.025	-0.018
	(0.133)	(0.166)	(0.138)	(0.136)
LS1	-0.048	-0.083	-0.048	-0.048
	(0.032)	(0.052)	(0.032)	(0.032)
LS2	0.030	0.035	0.030	0.030
	(0.085)	(0.101)	(0.085)	(0.085)
LS3	-0.015	0.115	0.024	0.019
	(0.049)	(0.089)	(0.057)	(0.054)
LS4	-0.005	-0.135	-0.057	-0.041
	(0.013)	(0.088)	(0.064)	(0.039)
R^2	0.017	0.020	0.015	0.018
AIC	804.288	434.351	555.788	599.516
N	564	306	394	424

Note: Standard errors in parentheses. ***Statistically significant at the 1% level; **significant at the 5% level; *significant at the 10% level. Regressions are performed without any control variable. The first column reports estimates obtained on the whole sample. Column 2 reports estimates obtained using households whose eldest child is between 7 and 14 years old (bandwidth of 4). Respectively, columns 3 and 4 report the results for households whose eldest child is between 6 and 15 years old (bandwidth of 5) or between 5 and 16 years old (bandwidth of 6). For the linear spline specification, the variables are defined as follows: $LS1 = \mathbb{1}_{A_i \geq 11}[(A_i-11)((A_i-11)<c)+c((A_i-11)\geq c)]$; $LS2 = ((A_i-11)\geq 0)(A_i-11-c)$; $LS3 = \mathbb{1}_{A_i<11}[(A_i-11)(A_i-11 \geq -c)-c((A_i-11)<-c)]$; $LS4 = ((A_i-11)<-c)(A_i-11+c)$, with c=3 for the whole sample and bandwidths of 5 and 6, c=2 for bandwidth of 4, due to a smaller sample size. $AIC = N\ln(\widehat{\sigma}^2_\epsilon)+2p$
Source: Health Barometer 1995.

Table A10. Continuity in the characteristics: Regression Discontinuity for y=craftsman

	All	Bandwidth=4	Bandwidth=5	Bandwidth=6
	(1)	(2)	(3)	(4)
	Dependent variable: craftsman			
	b/se	b/se	b/se	b/se
	Linear			
$\mathbb{1}_{A_i \geq 11}$	0.003	-0.017	-0.015	-0.010
	(0.022)	(0.033)	(0.031)	(0.028)
$\mathbb{1}_{A_i<11}(A_i - 11)$	0.002	0.011	0.009	0.007
	(0.002)	(0.008)	(0.006)	(0.005)
$\mathbb{1}_{A_i \geq 11}(A_i - 11)$	0.006	0.004	0.006	0.006
	(0.007)	(0.005)	(0.007)	(0.007)
R^2	0.011	0.006	0.009	0.011
AIC	-629.300	-288.595	-335.102	-392.204
	Linear Spline			
$\mathbb{1}_{A_i \geq 11}$	-0.022	-0.032	-0.020	-0.021
	(0.038)	(0.044)	(0.038)	(0.038)
LS1	0.004	0.046*	0.004	0.004
	(0.005)	(0.024)	(0.005)	(0.005)
LS2	0.011	-0.093**	0.011	0.011
	(0.032)	(0.043)	(0.032)	(0.032)
LS3	0.014	0.004	0.013	0.013
	(0.012)	(0.023)	(0.013)	(0.012)
LS4	-0.000	0.013	0.004	0.002
	(0.001)	(0.021)	(0.006)	(0.004)
R^2	0.013	0.039	0.009	0.011
AIC	-626.264	-296.939	-331.217	-388.453
N	564	306	394	424

Note: Standard errors in parentheses. ***Statistically significant at the 1% level; **significant at the 5% level; *significant at the 10% level. Regressions are performed without any control variable. The first column reports estimates obtained on the whole sample. Column 2 reports estimates obtained using households whose eldest child is between 7 and 14 years old (bandwidth of 4). Respectively, columns 3 and 4 report the results for households whose eldest child is between 6 and 15 years old (bandwidth of 5) or between 5 and 16 years old (bandwidth of 6). For the linear spline specification, the variables are defined as follows: $LS1 = \mathbb{1}_{A_i \geq 11}[(A_i - 11)((A_i - 11) < c) + c((A_i - 11) \geq c)]$; $LS2 = ((A_i - 11) \geq 0)(A_i - 11 - c)$; $LS3 = \mathbb{1}_{A_i<11}[(A_i - 11)(A_i - 11 \geq -c) - c((A_i - 11) < -c)]$; $LS4 = ((A_i - 11) < -c)(A_i - 11 + c)$, with c=3 for the whole sample and bandwidths of 5 and 6, c=2 for bandwidth of 4, due to a smaller sample size. $AIC = N \ln(\hat{\sigma}^2_\epsilon) + 2p$
Source: Health Barometer 1995.

Table A11. Continuity in the characteristics: Regression Discontinuity for y=executive

	All	Bandwidth=4	Bandwidth=5	Bandwidth=6
	(1)	(2)	(3)	(4)
	Dependent variable: executive			
	b/se	b/se	b/se	b/se
	Linear			
$\mathbb{1}_{A_i \geq 11}$	0.052	0.053	0.047	0.093
	(0.052)	(0.068)	(0.062)	(0.062)
$\mathbb{1}_{A_i < 11}(A_i - 11)$	-0.004	-0.002	0.001	-0.019
	(0.006)	(0.019)	(0.015)	(0.014)
$\mathbb{1}_{A_i \geq 11}(A_i - 11)$	-0.008	-0.009	-0.008	-0.008
	(0.014)	(0.022)	(0.014)	(0.014)
R^2	0.002	0.004	0.004	0.006
AIC	327.366	174.548	214.305	256.547
	Linear Spline			
$\mathbb{1}_{A_i \geq 11}$	0.101	0.172*	0.119	0.089
	(0.077)	(0.101)	(0.083)	(0.081)
LS1	-0.009	-0.031	-0.009	-0.009
	(0.022)	(0.033)	(0.022)	(0.022)
LS2	-0.006	0.043	-0.006	-0.006
	(0.058)	(0.068)	(0.059)	(0.059)
LS3	-0.026	-0.073	-0.040	-0.016
	(0.029)	(0.057)	(0.037)	(0.034)
LS4	0.001	0.065	0.050	-0.020
	(0.009)	(0.051)	(0.042)	(0.031)
R^2	0.003	0.011	0.008	0.006
AIC	330.818	176.251	216.476	260.539
N	564	306	394	424

Note: Standard errors in parentheses. ***Statistically significant at the 1% level; **significant at the 5% level; *significant at the 10% level. Regressions are performed without any control variable. The first column reports estimates obtained on the whole sample. Column 2 reports estimates obtained using households whose eldest child is between 7 and 14 years old (bandwidth of 4). Respectively, columns 3 and 4 report the results for households whose eldest child is between 6 and 15 years old (bandwidth of 5) or between 5 and 16 years old (bandwidth of 6). For the linear spline specification, the variables are defined as follows: $LS1 = \mathbb{1}_{A_i \geq 11}[(A_i - 11)((A_i - 11) < c) + c((A_i - 11) \geq c)]$; $LS2 = ((A_i - 11) \geq 0)(A_i - 11 - c)$; $LS3 = \mathbb{1}_{A_i < 11}[(A_i - 11)(A_i - 11 \geq -c) - c((A_i - 11) < -c)]$; $LS4 = ((A_i - 11) < -c)(A_i - 11 + c)$, with c=3 for the whole sample and bandwidths of 5 and 6, c=2 for bandwidth of 4, due to a smaller sample size. $AIC = N \ln(\widehat{\sigma}^2_\epsilon) + 2p$
Source: Health Barometer 1995.

Table A12. Continuity in the characteristics: Regression Discontinuity for y=employee

	All	Bandwidth=4	Bandwidth=5	Bandwidth=6
	(1)	(2)	(3)	(4)
	Dependent variable: employee			
	b/se	b/se	b/se	b/se
	Linear			
$\mathbb{1}_{A_i \geq 11}$	-0.139*	0.066	0.028	-0.046
	(0.081)	(0.118)	(0.106)	(0.098)
$\mathbb{1}_{A_i < 11}(A_i - 11)$	0.010	-0.071**	-0.056**	-0.023
	(0.009)	(0.036)	(0.028)	(0.021)
$\mathbb{1}_{A_i \geq 11}(A_i - 11)$	0.021	0.010	0.021	0.021
	(0.022)	(0.033)	(0.022)	(0.022)
R^2	0.005	0.022	0.021	0.012
AIC	820.269	443.378	570.730	617.376
	Linear Spline			
$\mathbb{1}_{A_i \geq 11}$	0.057	-0.115	0.010	0.045
	(0.133)	(0.165)	(0.138)	(0.137)
LS1	0.010	-0.069	0.010	0.010
	(0.033)	(0.054)	(0.033)	(0.033)
LS2	0.060	0.192*	0.060	0.060
	(0.091)	(0.106)	(0.091)	(0.091)
LS3	-0.077	0.093	-0.040	-0.067
	(0.049)	(0.089)	(0.057)	(0.054)
LS4	0.026**	-0.202**	-0.074	0.006
	(0.013)	(0.087)	(0.064)	(0.039)
R^2	0.012	0.044	0.021	0.014
AIC	820.660	440.585	574.421	620.371
N	564	306	394	424

Note: Standard errors in parentheses. ***Statistically significant at the 1% level; **significant at the 5% level; *significant at the 10% level. Regressions are performed without any control variable. The first column reports estimates obtained on the whole sample. Column 2 reports estimates obtained using households whose eldest child is between 7 and 14 years old (bandwidth of 4). Respectively, columns 3 and 4 report the results for households whose eldest child is between 6 and 15 years old (bandwidth of 5) or between 5 and 16 years old (bandwidth of 6). For the linear spline specification, the variables are defined as follows: $LS1 = \mathbb{1}_{A_i \geq 11}[(A_i - 11)((A_i - 11) < c) + c((A_i - 11) \geq c)]$; $LS2 = ((A_i - 11) \geq 0)(A_i - 11 - c)$; $LS3 = \mathbb{1}_{A_i < 11}[(A_i - 11)(A_i - 11 \geq -c) - c((A_i - 11) < -c)]$; $LS4 = ((A_i - 11) < -c)(A_i - 11 + c)$, with c=3 for the whole sample and bandwidths of 5 and 6, c=2 for bandwidth of 4, due to a smaller sample size. $AIC = N \ln(\widehat{\sigma}_\epsilon^2) + 2p$
Source: Health Barometer 1995.

Table A13. Continuity in the characteristics: Regression Discontinuity for y=blue collar worker

	All	Bandwidth=4	Bandwidth=5	Bandwidth=6
	(1)	(2)	(3)	(4)
	Dependent variable: blue collar worker			
	b/se	b/se	b/se	b/se
	Linear			
$\mathbb{1}_{A_i \geq 11}$	0.116	-0.092	-0.034	0.005
	(0.078)	(0.111)	(0.102)	(0.094)
$\mathbb{1}_{A_i<11}(A_i - 11)$	-0.014	0.061*	0.040	0.023
	(0.009)	(0.032)	(0.026)	(0.020)
$\mathbb{1}_{A_i \geq 11}(A_i - 11)$	-0.017	0.002	-0.017	-0.017
	(0.020)	(0.032)	(0.020)	(0.020)
R^2	0.006	0.015	0.010	0.007
AIC	767.009	414.463	525.928	565.280
	Linear Spline			
$\mathbb{1}_{A_i \geq 11}$	-0.103	0.062	-0.058	-0.073
	(0.126)	(0.155)	(0.131)	(0.129)
LS1	0.002	0.039	0.002	0.002
	(0.032)	(0.055)	(0.032)	(0.032)
LS2	-0.087	-0.083	-0.087	-0.087
	(0.085)	(0.106)	(0.085)	(0.085)
LS3	0.080*	-0.066	0.044	0.056
	(0.045)	(0.084)	(0.052)	(0.050)
LS4	-0.032***	0.160**	0.035	0.001
	(0.012)	(0.081)	(0.059)	(0.036)
R^2	0.015	0.025	0.012	0.010
AIC	765.904	415.296	529.197	568.050
N	564	306	394	424

Note: Standard errors in parentheses. ***Statistically significant at the 1% level; **significant at the 5% level; *significant at the 10% level. Regressions are performed without any control variable. The first column reports estimates obtained on the whole sample. Column 2 reports estimates obtained using households whose eldest child is between 7 and 14 years old (bandwidth of 4). Respectively, columns 3 and 4 report the results for households whose eldest child is between 6 and 15 years old (bandwidth of 5) or between 5 and 16 years old (bandwidth of 6). For the linear spline specification, the variables are defined as follows: $LS1 = \mathbb{1}_{A_i \geq 11}[(A_i - 11)((A_i - 11) < c) + c((A_i - 11) \geq c)]$; $LS2 = ((A_i - 11) \geq 0)(A_i - 11 - c)$; $LS3 = \mathbb{1}_{A_i<11}[(A_i - 11)(A_i - 11 \geq -c) - c((A_i - 11) < -c)]$; $LS4 = ((A_i - 11) < -c)(A_i - 11 + c)$, with c=3 for the whole sample and bandwidths of 5 and 6, c=2 for bandwidth of 4, due to a smaller sample size. $AIC = N \ln(\widehat{\sigma}^2_\epsilon) + 2p$
Source: Health Barometer 1995.

Table A14. Continuity in the characteristics: Regression Discontinuity for y=married household

	All	Bandwidth=4	Bandwidth=5	Bandwidth=6
	(1)	(2)	(3)	(4)
	Dependent variable: married household			
	b/se	b/se	b/se	b/se
	Linear			
$\mathbb{1}_{A_i \geq 11}$	0.009	0.004	-0.007	-0.008
	(0.050)	(0.072)	(0.067)	(0.061)
$\mathbb{1}_{A_i<11}(A_i - 11)$	-0.004	-0.009	-0.001	-0.000
	(0.005)	(0.021)	(0.017)	(0.013)
$\mathbb{1}_{A_i \geq 11}(A_i - 11)$	-0.019	-0.013	-0.019	-0.019
	(0.015)	(0.023)	(0.015)	(0.015)
R^2	0.011	0.005	0.010	0.009
AIC	314.592	174.207	255.534	268.954
	Linear Spline			
$\mathbb{1}_{A_i \geq 11}$	-0.015	-0.019	0.003	0.001
	(0.081)	(0.101)	(0.085)	(0.083)
LS1	-0.013	-0.004	-0.013	-0.013
	(0.023)	(0.036)	(0.023)	(0.023)
LS2	-0.039	-0.034	-0.039	-0.039
	(0.068)	(0.076)	(0.068)	(0.068)
LS3	0.004	0.004	-0.010	-0.008
	(0.029)	(0.054)	(0.034)	(0.032)
LS4	-0.006	-0.017	0.009	0.005
	(0.007)	(0.053)	(0.040)	(0.023)
R^2	0.011	0.005	0.010	0.010
AIC	318.371	178.062	259.335	272.765
N	564	306	394	424

Note: Standard errors in parentheses. ***Statistically significant at the 1% level; **significant at the 5% level; *significant at the 10% level. Regressions are performed without any control variable. The first column reports estimates obtained on the whole sample. Column 2 reports estimates obtained using households whose eldest child is between 7 and 14 years old (bandwidth of 4). Respectively, columns 3 and 4 report the results for households whose eldest child is between 6 and 15 years old (bandwidth of 5) or between 5 and 16 years old (bandwidth of 6). For the linear spline specification, the variables are defined as follows: $LS1 = \mathbb{1}_{A_i \geq 11}[(A_i - 11)((A_i - 11) < c) + c((A_i - 11) \geq c)]$; $LS2 = ((A_i - 11) \geq 0)(A_i - 11 - c)$; $LS3 = \mathbb{1}_{A_i<11}[(A_i - 11)(A_i - 11 \geq -c) - c((A_i - 11) < -c)]$; $LS4 = ((A_i - 11) < -c)(A_i - 11 + c)$, with c=3 for the whole sample and bandwidths of 5 and 6, c=2 for bandwidth of 4, due to a smaller sample size. $AIC = N \ln(\widehat{\sigma}^2_\epsilon) + 2p$
Source: Health Barometer 1995.

Table A15. Continuity in the characteristics: Regression Discontinuity for y=one child in the household

	All	Bandwidth=4	Bandwidth=5	Bandwidth=6
	(1)	(2)	(3)	(4)
	Dependent variable: one child in the household			
	b/se	b/se	b/se	b/se
	Linear			
$\mathbb{1}_{A_i \geq 11}$	0.227***	-0.047	-0.037	-0.007
	(0.074)	(0.108)	(0.098)	(0.090)
$\mathbb{1}_{A_i<11}(A_i - 11)$	-0.073***	0.037	0.017	0.004
	(0.008)	(0.032)	(0.025)	(0.019)
$\mathbb{1}_{A_i \geq 11}(A_i - 11)$	0.040*	0.007	0.040*	0.040*
	(0.021)	(0.030)	(0.021)	(0.021)
R^2	0.127	0.008	0.022	0.019
AIC	731.573	386.683	513.042	551.997
	Linear Spline			
$\mathbb{1}_{A_i \geq 11}$	-0.147	-0.078	-0.069	-0.071
	(0.122)	(0.153)	(0.128)	(0.126)
LS1	0.007	0.010	0.007	0.007
	(0.030)	(0.051)	(0.030)	(0.030)
LS2	0.155*	0.000	0.155*	0.155*
	(0.088)	(0.102)	(0.088)	(0.088)
LS3	0.115***	0.058	0.052	0.054
	(0.044)	(0.080)	(0.052)	(0.049)
LS4	-0.108***	-0.010	-0.023	-0.029
	(0.010)	(0.076)	(0.057)	(0.035)
R^2	0.159	0.008	0.028	0.026
AIC	714.536	390.674	514.377	552.709
N	564	306	394	424

Note: Standard errors in parentheses. ***Statistically significant at the 1% level; **significant at the 5% level; *significant at the 10% level. Regressions are performed without any control variable. The first column reports estimates obtained on the whole sample. Column 2 reports estimates obtained using households whose eldest child is between 7 and 14 years old (bandwidth of 4). Respectively, columns 3 and 4 report the results for households whose eldest child is between 6 and 15 years old (bandwidth of 5) or between 5 and 16 years old (bandwidth of 6). For the linear spline specification, the variables are defined as follows: $LS1 = \mathbb{1}_{A_i \geq 11}[(A_i - 11)((A_i - 11) < c) + c((A_i - 11) \geq c)]$; $LS2 = ((A_i - 11) \geq 0)(A_i - 11 - c)$; $LS3 = \mathbb{1}_{A_i<11}[(A_i - 11)(A_i - 11 \geq -c) - c((A_i - 11) < -c)]$; $LS4 = ((A_i - 11) < -c)(A_i - 11 + c)$, with c=3 for the whole sample and bandwidths of 5 and 6, c=2 for bandwidth of 4, due to a smaller sample size. $AIC = N \ln(\widehat{\sigma}_{\epsilon}^2) + 2p$
Source: Health Barometer 1995.

C McCrary test for continuity in the number of individus at the age of 11

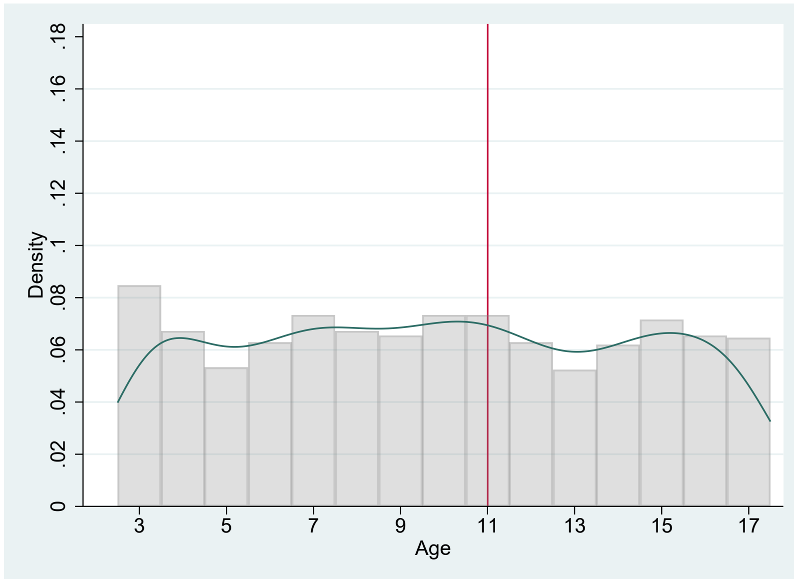


Figure A16. Density of the number of children per age

V Robustness checks

A Use of different bandwidths and different functional forms

Table A17. Regression Discontinuity on the eldest child sample: Local linear estimates

	All		Bandwidth=4		Bandwidth=5		Bandwidth=6	
	Dependent variable: hepatitis B vaccination							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	b/se	b/se	b/se	b/se	b/se	b/se	b/se	b/se
$\mathbb{1}_{A_i \geq 11}$	0.444***	0.428***	0.512***	0.491***	0.436***	0.433***	0.432***	0.427***
	(0.072)	(0.075)	(0.104)	(0.106)	(0.092)	(0.092)	(0.085)	(0.087)
$\mathbb{1}_{A_i<11}(A_i - 11)$	-0.002	0.008	-0.026	-0.019	0.002	0.007	0.004	0.013
	(0.008)	(0.011)	(0.033)	(0.033)	(0.023)	(0.024)	(0.018)	(0.018)
$\mathbb{1}_{A_i \geq 11}(A_i - 11)$	0.032*	0.030	0.008	0.022	0.032*	0.033*	0.032*	0.032
	(0.018)	(0.019)	(0.031)	(0.033)	(0.018)	(0.019)	(0.018)	(0.019)
male		-0.000		-0.038		-0.026		-0.012
		(0.041)		(0.057)		(0.049)		(0.048)
parents' age		-0.004		-0.007		-0.006		-0.007
		(0.004)		(0.005)		(0.005)		(0.005)
h. school dipl.		-0.002		-0.047		-0.025		-0.016
		(0.041)		(0.058)		(0.048)		(0.047)
social category (reference: employee)								
farmer		-0.166**		-0.077		-0.113		-0.129
		(0.075)		(0.094)		(0.100)		(0.098)
craftsman		0.087		-0.003		0.037		0.022
		(0.147)		(0.196)		(0.146)		(0.147)
executive		0.003		0.133		0.090		0.027
		(0.061)		(0.085)		(0.076)		(0.070)
blue collar worker		-0.056		-0.090		-0.086		-0.109**
		(0.044)		(0.061)		(0.052)		(0.050)
pensioner		-0.145		0.101		-0.129		-0.153
		(0.257)		(0.255)		(0.262)		(0.263)
other profession		-0.068		-0.395***		-0.148		-0.154
		(0.160)		(0.097)		(0.199)		(0.198)
marital status (reference: married)								
single		-0.126		0.213		0.026		-0.069
		(0.104)		(0.232)		(0.207)		(0.173)
separate		-0.003		-0.069		-0.009		-0.030
		(0.071)		(0.099)		(0.074)		(0.074)
nb of children (reference: one child)								
2		-0.079		-0.113		-0.126**		-0.146**
		(0.049)		(0.074)		(0.061)		(0.058)
3		-0.105		-0.090		-0.109		-0.141*
		(0.068)		(0.092)		(0.079)		(0.076)
4 and +		-0.133		-0.198		-0.162		-0.175
		(0.134)		(0.137)		(0.137)		(0.137)
R^2	0.248	0.260	0.210	0.248	0.261	0.284	0.268	0.291
AIC	663.632	681.930	379.570	392.306	456.599	472.224	490.122	504.028
N	564	564	306	306	394	394	424	424

Note: Standard errors in parentheses. ***Statistically significant at the 1% level; **significant at the 5% level; *significant at the 10% level. Columns 1 and 2 report estimates performed on the whole sample of children. Columns 3 and 4 report estimates obtained using children between 7 and 14 years old (bandwidth of 4). Columns 5 and 6 report estimates obtained using children between 6 and 15 years old (bandwidth of 5). Columns 7 and 8 report estimates obtained using children between 5 and 16 years old (bandwidth of 6). Columns 1, 3, 5 and 7 report estimates without control variables while columns 2, 4, 6 and 8 include them. $AIC = N \ln(\widehat{\sigma}_\epsilon^2) + 2p$

Source: Health Barometer 1995.

Table A18. Regression Discontinuity on all children: Local linear estimates

	All		Bandwidth=4		Bandwidth=5		Bandwidth=6	
	Dependent variable: hepatitis B vaccination							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	b/se	b/se	b/se	b/se	b/se	b/se	b/se	b/se
$\mathbb{1}_{A_i \geq 11}$	0.451***	0.448***	0.469***	0.464***	0.422***	0.424***	0.431***	0.433***
	(0.052)	(0.053)	(0.075)	(0.075)	(0.065)	(0.066)	(0.061)	(0.062)
$\mathbb{1}_{A_i<11}(A_i - 11)$	0.003	0.009	-0.002	0.002	0.015	0.018	0.011	0.015
	(0.005)	(0.006)	(0.022)	(0.022)	(0.015)	(0.016)	(0.012)	(0.012)
$\mathbb{1}_{A_i \geq 11}(A_i - 11)$	0.028*	0.026*	0.012	0.017	0.028*	0.028*	0.028*	0.027*
	(0.015)	(0.016)	(0.024)	(0.025)	(0.015)	(0.016)	(0.015)	(0.016)
male		0.002		-0.038		-0.039		-0.025
		(0.028)		(0.040)		(0.036)		(0.034)
parents' age		-0.006**		-0.007*		-0.006		-0.006*
		(0.003)		(0.004)		(0.003)		(0.003)
h. school dipl.		-0.022		-0.053		-0.032		-0.028
		(0.028)		(0.041)		(0.035)		(0.034)
social category (reference: employee)								
farmer		-0.174***		-0.130*		-0.143**		-0.149**
		(0.046)		(0.068)		(0.066)		(0.066)
craftsman		0.069		-0.046		-0.026		-0.029
		(0.111)		(0.132)		(0.115)		(0.116)
executive		-0.051		-0.019		-0.030		-0.041
		(0.042)		(0.060)		(0.055)		(0.051)
blue collar worker		-0.059*		-0.097**		-0.087**		-0.099***
		(0.031)		(0.044)		(0.039)		(0.037)
pensioner		-0.118		0.093		-0.125		-0.142
		(0.247)		(0.240)		(0.250)		(0.250)
other profession		-0.077		-0.409***		-0.202		-0.215
		(0.107)		(0.065)		(0.150)		(0.132)
marital status (reference: married)								
single		-0.131		0.044		-0.079		-0.140
		(0.092)		(0.232)		(0.189)		(0.152)
separate		0.035		-0.009		0.006		0.011
		(0.051)		(0.068)		(0.056)		(0.056)
nb of children (reference: one child)								
2		-0.059*		-0.057		-0.076		-0.089*
		(0.035)		(0.059)		(0.049)		(0.047)
3		-0.095**		-0.074		-0.091		-0.114**
		(0.040)		(0.065)		(0.056)		(0.054)
4 and +		-0.029		-0.099		-0.085		-0.089
		(0.059)		(0.085)		(0.071)		(0.070)
R^2	0.247	0.263	0.231	0.254	0.275	0.291	0.274	0.293
AIC	1248.616	1253.184	690.421	701.333	818.365	830.172	881.721	889.256
N	1100	1100	575	575	717	717	775	775

Note: Standard errors in parentheses. ***Statistically significant at the 1% level; **significant at the 5% level; *significant at the 10% level. Columns 1 and 2 report estimates performed on the whole sample of children. Columns 3 and 4 report estimates obtained using children between 7 and 14 years old (bandwidth of 4). Columns 5 and 6 report estimates obtained using children between 6 and 15 years old (bandwidth of 5). Columns 7 and 8 report estimates obtained using children between 5 and 16 years old (bandwidth of 6). Columns 1, 3, 5 and 7 report estimates without control variables while columns 2, 4, 6 and 8 include them. $AIC = N \ln(\widehat{\sigma}_\epsilon^2) + 2p$
Source: Health Barometer 1995.

Table A19. Regression Discontinuity on the eldest child sample: Local Linear Spline estimates

	All		Bandwidth=4		Bandwidth=5		Bandwidth=6	
	Dependent variable: hepatitis B vaccination							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	b/se	b/se	b/se	b/se	b/se	b/se	b/se	b/se
$\mathbb{1}_{A_i \geq 11}$	0.482***	0.481***	0.412***	0.393***	0.495***	0.484***	0.490***	0.484***
	(0.115)	(0.117)	(0.143)	(0.142)	(0.119)	(0.118)	(0.118)	(0.118)
LS1	0.008	0.008	0.074	0.090*	0.008	0.012	0.008	0.011
	(0.031)	(0.032)	(0.051)	(0.051)	(0.031)	(0.032)	(0.031)	(0.032)
LS2	0.118	0.112	-0.146	-0.140	0.118	0.107	0.118	0.106
	(0.075)	(0.077)	(0.097)	(0.102)	(0.075)	(0.079)	(0.075)	(0.078)
LS3	-0.010	-0.007	0.017	0.021	-0.020	-0.012	-0.016	-0.008
	(0.041)	(0.042)	(0.077)	(0.080)	(0.048)	(0.048)	(0.046)	(0.046)
LS4	-0.001	0.011	-0.049	-0.039	0.028	0.029	0.017	0.026
	(0.011)	(0.015)	(0.083)	(0.088)	(0.051)	(0.051)	(0.033)	(0.033)
male		0.001		-0.040		-0.026		-0.011
		(0.042)		(0.056)		(0.049)		(0.048)
parents' age		-0.005		-0.006		-0.005		-0.007
		(0.004)		(0.005)		(0.005)		(0.005)
h. school dipl.		-0.003		-0.044		-0.025		-0.016
		(0.041)		(0.058)		(0.049)		(0.047)
social category (reference: employee)								
farmer		-0.169**		-0.096		-0.117		-0.134
		(0.076)		(0.092)		(0.100)		(0.099)
craftsman		0.088		-0.064		0.036		0.023
		(0.146)		(0.208)		(0.145)		(0.146)
executive		0.003		0.134		0.088		0.027
		(0.062)		(0.085)		(0.077)		(0.070)
blue collar		-0.054		-0.095		-0.084		-0.106**
		(0.044)		(0.061)		(0.053)		(0.050)
pensioner		-0.148		0.057		-0.133		-0.155
		(0.262)		(0.257)		(0.266)		(0.267)
other profession		-0.066		-0.377***		-0.144		-0.150
		(0.156)		(0.099)		(0.195)		(0.194)
marital status (reference: married)								
single		-0.127		0.222		0.024		-0.067
		(0.105)		(0.227)		(0.212)		(0.176)
separate		-0.003		-0.071		-0.009		-0.029
		(0.071)		(0.099)		(0.074)		(0.073)
nb of children (reference: one child)								
2		-0.082		-0.103		-0.125**		-0.146**
		(0.050)		(0.074)		(0.061)		(0.058)
3		-0.103		-0.089		-0.102		-0.137*
		(0.068)		(0.092)		(0.080)		(0.076)
4 and +		-0.124		-0.176		-0.149		-0.164
		(0.138)		(0.144)		(0.142)		(0.141)
R^2	0.249	0.262	0.217	0.256	0.264	0.286	0.270	0.294
AIC	666.323	684.640	380.732	393.294	459.015	475.040	492.593	506.799
N	564	564	306	306	394	394	424	424

Note: Standard errors in parentheses. ***Statistically significant at the 1% level; **significant at the 5% level; *significant at the 10% level. Columns 1 and 2 report estimates performed on the whole sample of children. Columns 3 and 4 report estimates obtained using children between 7 and 14 years old (bandwidth of 4). Columns 5 and 6 report estimates obtained using children between 6 and 15 years old (bandwidth of 5). Columns 7 and 8 report estimates obtained using children between 5 and 16 years old (bandwidth of 6). Columns 1, 3, 5 and 7 report estimates without control variables while columns 2, 4, 6 and 8 include them. For the linear spline specification, the variables are defined as follows: $LS1 = \mathbb{1}_{A_i \geq 11}[(A_i - 11)((A_i - 11) < c) + c((A_i - 11) \geq c)]$; $LS2 = ((A_i - 11) \geq 0)(A_i - 11 - c)$; $LS3 = \mathbb{1}_{A_i < 11}[(A_i - 11)(A_i - 11 \geq -c) - c((A_i - 11) < -c)]$; $LS4 = ((A_i - 11) < -c)(A_i - 11 + c)$, with c=3 for the whole sample and bandwidths of 5 and 6, c=2 for bandwidth of 4, due to a smaller sample size. $AIC = N \ln(\widehat{\sigma}^2_\epsilon) + 2p$
Source: Health Barometer 1995.

Table A20. Regression Discontinuity on all children: Local Linear Spline estimates

	All		Bandwidth=4		Bandwidth=5		Bandwidth=6	
	Dependent variable: hepatitis B vaccination							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	b/se	b/se	b/se	b/se	b/se	b/se	b/se	b/se
$\mathbb{1}_{A_i \geq 11}$	0.443***	0.456***	0.414***	0.409***	0.454***	0.456***	0.448***	0.449***
	(0.082)	(0.083)	(0.102)	(0.103)	(0.085)	(0.086)	(0.084)	(0.085)
LS1	0.012	0.010	0.033	0.041	0.012	0.012	0.012	0.011
	(0.024)	(0.024)	(0.040)	(0.040)	(0.024)	(0.025)	(0.024)	(0.024)
LS2	0.088	0.090	-0.037	-0.042	0.088	0.087	0.088	0.086
	(0.063)	(0.063)	(0.077)	(0.077)	(0.063)	(0.064)	(0.063)	(0.064)
LS3	0.013	0.012	0.026	0.028	0.004	0.008	0.009	0.014
	(0.028)	(0.028)	(0.052)	(0.053)	(0.033)	(0.033)	(0.032)	(0.032)
LS4	0.001	0.008	-0.026	-0.021	0.026	0.029	0.012	0.016
	(0.007)	(0.008)	(0.053)	(0.055)	(0.032)	(0.033)	(0.022)	(0.022)
male		0.003		-0.038		-0.038		-0.024
		(0.028)		(0.040)		(0.036)		(0.035)
parents' age		-0.006**		-0.007*		-0.006		-0.006*
		(0.003)		(0.004)		(0.003)		(0.003)
h. school dipl.		-0.023		-0.053		-0.034		-0.030
		(0.028)		(0.041)		(0.035)		(0.034)
social category (reference: employee)								
farmer		-0.176***		-0.131*		-0.145**		-0.151**
		(0.046)		(0.069)		(0.066)		(0.066)
craftsman		0.067		-0.057		-0.027		-0.031
		(0.111)		(0.133)		(0.115)		(0.115)
executive		-0.051		-0.018		-0.031		-0.041
		(0.042)		(0.061)		(0.055)		(0.051)
blue collar		-0.059*		-0.099**		-0.088**		-0.099***
		(0.031)		(0.045)		(0.039)		(0.037)
pensioner		-0.121		0.083		-0.129		-0.144
		(0.251)		(0.241)		(0.253)		(0.254)
other profession		-0.077		-0.402***		-0.203		-0.216*
		(0.106)		(0.064)		(0.148)		(0.129)
marital status (reference: married)								
single		-0.134		0.044		-0.083		-0.146
		(0.092)		(0.232)		(0.192)		(0.154)
separate		0.035		-0.011		0.007		0.012
		(0.051)		(0.068)		(0.056)		(0.055)
nb of children (reference: one child)								
2		-0.058		-0.056		-0.074		-0.088*
		(0.036)		(0.059)		(0.049)		(0.047)
3		-0.093**		-0.076		-0.087		-0.111**
		(0.040)		(0.065)		(0.056)		(0.054)
4 and +		-0.027		-0.099		-0.080		-0.086
		(0.059)		(0.085)		(0.071)		(0.070)
R^2	0.248	0.264	0.232	0.255	0.276	0.292	0.275	0.294
AIC	1251.630	1256.172	693.694	704.382	821.368	833.204	884.856	892.388
N	1100	1100	575	575	717	717	775	775

Note: Standard errors in parentheses. ***Statistically significant at the 1% level; **significant at the 5% level; *significant at the 10% level. Columns 1 and 2 report estimates performed on the whole sample of children. Columns 3 and 4 report estimates obtained using children between 7 and 14 years old (bandwidth of 4). Columns 5 and 6 report estimates obtained using children between 6 and 15 years old (bandwidth of 5). Columns 7 and 8 report estimates obtained using children between 5 and 16 years old (bandwidth of 6). Columns 1, 3, 5 and 7 report estimates without control variables while columns 2, 4, 6 and 8 include them. For the linear spline specification, the variables are defined as follows: $LS1 = \mathbb{1}_{A_i \geq 11}[(A_i - 11)((A_i - 11) < c) + c((A_i - 11) \geq c)]$; $LS2 = ((A_i - 11) \geq 0)(A_i - 11 - c)$; $LS3 = \mathbb{1}_{A_i < 11}[(A_i - 11)(A_i - 11 \geq -c) - c((A_i - 11) < -c)]$; $LS4 = ((A_i - 11) < -c)(A_i - 11 + c)$, with c=3 for the whole sample and bandwidths of 5 and 6, c=2 for bandwidth of 4, due to a smaller sample size. $AIC = N \ln(\widehat{\sigma}^2_\epsilon) + 2p$
Source: Health Barometer 1995.

Table A21. Regression Discontinuity on the eldest child sample: Local linear estimates

	All		Bandwidth=4		Bandwidth=5		Bandwidth=6	
	Dependent variable: MMR vaccination							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	b/se	b/se	b/se	b/se	b/se	b/se	b/se	b/se
$\mathbb{1}_{A_i \geq 11}$	-0.250***	-0.235***	-0.140*	-0.163**	-0.134*	-0.134**	-0.135**	-0.130**
	(0.060)	(0.059)	(0.077)	(0.075)	(0.069)	(0.067)	(0.064)	(0.063)
$\mathbb{1}_{A_i<11}(A_i - 11)$	0.023***	0.017*	-0.011	-0.006	-0.012	-0.014	-0.012	-0.015
	(0.007)	(0.008)	(0.019)	(0.021)	(0.014)	(0.015)	(0.010)	(0.011)
$\mathbb{1}_{A_i \geq 11}(A_i - 11)$	0.017	0.017	0.023	0.013	0.017	0.017	0.017	0.017
	(0.018)	(0.017)	(0.028)	(0.028)	(0.018)	(0.017)	(0.018)	(0.017)
male		0.016		0.026		0.036		0.035
		(0.031)		(0.042)		(0.036)		(0.034)
parents' age		0.002		0.003		0.000		-0.000
		(0.003)		(0.004)		(0.004)		(0.003)
h. school dipl.		-0.102***		-0.196***		-0.159***		-0.149***
		(0.034)		(0.046)		(0.040)		(0.038)
social category (reference: employee)								
farmer		0.057		0.121***		0.102***		0.100***
		(0.057)		(0.044)		(0.036)		(0.035)
craftsman		-0.192		-0.221		-0.193		-0.196
		(0.141)		(0.190)		(0.153)		(0.152)
executive		-0.020		0.051		0.010		-0.006
		(0.054)		(0.074)		(0.065)		(0.060)
blue collar worker		-0.011		-0.021		-0.017		-0.018
		(0.035)		(0.047)		(0.042)		(0.039)
pensioner		0.176***		0.178*		0.174**		0.177**
		(0.062)		(0.097)		(0.072)		(0.069)
other profession		-0.026		-0.224		-0.106		-0.108
		(0.126)		(0.241)		(0.179)		(0.178)
marital status (reference: married)								
single		0.031		-0.052		-0.035		-0.030
		(0.085)		(0.201)		(0.146)		(0.119)
separate		-0.074		0.009		-0.084		-0.082
		(0.065)		(0.073)		(0.070)		(0.068)
nb of children (reference: one child)								
2		0.068*		0.084		0.043		0.032
		(0.039)		(0.062)		(0.052)		(0.048)
3		0.056		0.097		0.056		0.048
		(0.053)		(0.075)		(0.062)		(0.057)
4 and +		0.194***		0.229***		0.178***		0.174***
		(0.052)		(0.081)		(0.059)		(0.057)
R^2	0.037	0.083	0.040	0.143	0.038	0.124	0.044	0.126
AIC	422.102	422.557	228.550	221.864	287.463	278.673	286.281	276.413
N	564	564	306	306	394	394	424	424

Note: Standard errors in parentheses. ***Statistically significant at the 1% level; **significant at the 5% level; *significant at the 10% level. Columns 1 and 2 report estimates performed on the whole sample of children. Columns 3 and 4 report estimates obtained using children between 7 and 14 years old (bandwidth of 4). Columns 5 and 6 report estimates obtained using children between 6 and 15 years old (bandwidth of 5). Columns 7 and 8 report estimates obtained using children between 5 and 16 years old (bandwidth of 6). Columns 1, 3, 5 and 7 report estimates without control variables while columns 2, 4, 6 and 8 include them. $AIC = N \ln(\widehat{\sigma}_\epsilon^2) + 2p$
Source: Health Barometer 1995.

Table A22. Regression Discontinuity on all children: Local linear estimates

	All		Bandwidth=4		Bandwidth=5		Bandwidth=6	
	Dependent variable: MMR vaccination							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	b/se	b/se	b/se	b/se	b/se	b/se	b/se	b/se
$\mathbb{1}_{A_i<11}$	-0.225***	-0.224***	-0.120**	-0.114**	-0.147***	-0.139***	-0.148***	-0.141***
	(0.046)	(0.045)	(0.058)	(0.057)	(0.053)	(0.052)	(0.050)	(0.049)
$\mathbb{1}_{A_i<11}(A_i-11)$	0.022***	0.021***	-0.010	-0.010	0.000	-0.003	0.001	-0.001
	(0.005)	(0.005)	(0.015)	(0.015)	(0.012)	(0.012)	(0.009)	(0.009)
$\mathbb{1}_{A_i\geq 11}(A_i-11)$	0.011	0.012	0.003	-0.005	0.011	0.010	0.011	0.010
	(0.015)	(0.015)	(0.022)	(0.022)	(0.015)	(0.015)	(0.015)	(0.015)
male		0.042*		0.043		0.050*		0.047*
		(0.024)		(0.033)		(0.029)		(0.027)
parents' age		-0.001		0.001		0.000		-0.000
		(0.002)		(0.003)		(0.003)		(0.002)
h. school dipl.		-0.104***		-0.155***		-0.148***		-0.132***
		(0.025)		(0.034)		(0.030)		(0.029)
social category (reference: employee)								
farmer		0.116***		0.130***		0.120***		0.122***
		(0.032)		(0.029)		(0.024)		(0.023)
craftsman		-0.085		-0.116		-0.118		-0.124
		(0.087)		(0.108)		(0.099)		(0.099)
executive		0.023		0.042		0.030		0.018
		(0.036)		(0.049)		(0.044)		(0.042)
blue collar worker		-0.051*		-0.057		-0.065**		-0.065**
		(0.027)		(0.035)		(0.032)		(0.030)
pensioner		0.211***		0.227***		0.190***		0.193***
		(0.052)		(0.073)		(0.059)		(0.056)
other profession		-0.098		-0.129		-0.067		-0.065
		(0.101)		(0.165)		(0.133)		(0.118)
marital status (reference: married)								
single		-0.011		0.008		-0.059		-0.105
		(0.082)		(0.161)		(0.134)		(0.124)
separate		-0.027		0.023		-0.028		-0.019
		(0.045)		(0.053)		(0.051)		(0.047)
nb of children (reference: one child)								
2		0.040		0.068		0.052		0.037
		(0.033)		(0.051)		(0.045)		(0.042)
3		0.062*		0.099*		0.084*		0.068
		(0.035)		(0.053)		(0.047)		(0.044)
4 and +		-0.013		0.060		0.042		0.017
		(0.053)		(0.073)		(0.062)		(0.060)
R^2	0.031	0.065	0.037	0.101	0.030	0.090	0.030	0.082
AIC	926.416	915.397	458.788	447.304	573.016	555.142	602.337	587.801
N	1100	1100	575	575	717	717	775	775

Note: Standard errors in parentheses. ***Statistically significant at the 1% level; **significant at the 5% level; *significant at the 10% level. Columns 1 and 2 report estimates performed on the whole sample of children. Columns 3 and 4 report estimates obtained using children between 7 and 14 years old (bandwidth of 4). Columns 5 and 6 report estimates obtained using children between 6 and 15 years old (bandwidth of 5). Columns 7 and 8 report estimates obtained using children between 5 and 16 years old (bandwidth of 6). Columns 1, 3, 5 and 7 report estimates without control variables while columns 2, 4, 6 and 8 include them. $AIC = N \ln(\widehat{\sigma}^2_\epsilon) + 2p$

Source: Health Barometer 1995.

Table A23. Regression Discontinuity on the eldest child sample: Local Linear Spline estimates

	All		Bandwidth=4		Bandwidth=5		Bandwidth=6	
	Dependent variable: MMR vaccination							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	b/se	b/se	b/se	b/se	b/se	b/se	b/se	b/se
$\mathbb{1}_{A_i \geq 11}$	-0.086	-0.082	-0.156	-0.196*	-0.147	-0.156*	-0.145	-0.150*
	(0.087)	(0.088)	(0.107)	(0.111)	(0.090)	(0.092)	(0.089)	(0.089)
LS1	0.023	0.019	0.061	0.055	0.023	0.017	0.023	0.018
	(0.028)	(0.027)	(0.045)	(0.042)	(0.028)	(0.027)	(0.028)	(0.027)
LS2	-0.003	0.009	-0.065	-0.087	-0.003	0.015	-0.003	0.014
	(0.071)	(0.069)	(0.084)	(0.081)	(0.071)	(0.070)	(0.071)	(0.070)
LS3	-0.055*	-0.056*	-0.016	0.001	-0.007	-0.001	-0.009	-0.004
	(0.029)	(0.030)	(0.050)	(0.055)	(0.033)	(0.037)	(0.031)	(0.033)
LS4	0.038***	0.032***	0.004	-0.007	-0.018	-0.028	-0.014	-0.021
	(0.010)	(0.011)	(0.042)	(0.046)	(0.031)	(0.034)	(0.018)	(0.019)
male		0.020		0.024		0.037		0.035
		(0.031)		(0.042)		(0.036)		(0.034)
parents' age		0.001		0.003		0.000		-0.000
		(0.003)		(0.004)		(0.004)		(0.003)
h. school dipl.		-0.099***		-0.193***		-0.160***		-0.150***
		(0.034)		(0.046)		(0.041)		(0.038)
social category (reference: employee)								
farmer		0.057		0.111**		0.102***		0.101***
		(0.059)		(0.046)		(0.036)		(0.035)
craftsman		-0.178		-0.259		-0.193		-0.197
		(0.142)		(0.196)		(0.154)		(0.153)
executive		-0.020		0.051		0.011		-0.006
		(0.054)		(0.074)		(0.067)		(0.060)
blue collar		-0.006		-0.024		-0.017		-0.019
		(0.035)		(0.046)		(0.042)		(0.039)
pensioner		0.177***		0.150		0.175**		0.176**
		(0.062)		(0.097)		(0.073)		(0.069)
other profession		-0.020		-0.215		-0.108		-0.110
		(0.117)		(0.248)		(0.181)		(0.179)
marital status (reference: married)								
single		0.040		-0.046		-0.038		-0.034
		(0.086)		(0.201)		(0.148)		(0.122)
separate		-0.080		0.008		-0.083		-0.081
		(0.065)		(0.074)		(0.070)		(0.069)
nb of children (reference: one child)								
2		0.050		0.089		0.044		0.033
		(0.040)		(0.062)		(0.053)		(0.049)
3		0.046		0.099		0.054		0.047
		(0.053)		(0.075)		(0.063)		(0.058)
4 and +		0.193***		0.243***		0.175***		0.172***
		(0.050)		(0.083)		(0.062)		(0.059)
R^2	0.047	0.091	0.045	0.149	0.039	0.124	0.044	0.126
AIC	420.342	421.639	231.080	223.886	291.330	282.531	290.154	280.309
N	564	564	306	306	394	394	424	424

Note: Standard errors in parentheses. ***Statistically significant at the 1% level; **significant at the 5% level; *significant at the 10% level. Columns 1 and 2 report estimates performed on the whole sample of children. Columns 3 and 4 report estimates obtained using children between 7 and 14 years old (bandwidth of 4). Columns 5 and 6 report estimates obtained using children between 6 and 15 years old (bandwidth of 5). Columns 7 and 8 report estimates obtained using children between 5 and 16 years old (bandwidth of 6). Columns 1, 3, 5 and 7 report estimates without control variables while columns 2, 4, 6 and 8 include them. For the linear spline specification, the variables are defined as follows: $LS1 = \mathbb{1}_{A_i \geq 11}[(A_i - 11)((A_i - 11) < c) + c((A_i - 11) \geq c)]$; $LS2 = ((A_i - 11) \geq 0)(A_i - 11 - c)$; $LS3 = \mathbb{1}_{A_i < 11}[(A_i - 11)(A_i - 11 \geq -c) - c((A_i - 11) < -c)]$; $LS4 = ((A_i - 11) < -c)(A_i - 11 + c)$, with c=3 for the whole sample and bandwidths of 5 and 6, c=2 for bandwidth of 4, due to a smaller sample size. $AIC = N \ln(\widehat{\sigma}^2_\epsilon) + 2p$
Source: Health Barometer 1995.

Table A24. Regression Discontinuity on all children: Local Linear Spline estimates

	All		Bandwidth=4		Bandwidth=5		Bandwidth=6	
	Dependent variable: MMR vaccination							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	b/se	b/se	b/se	b/se	b/se	b/se	b/se	b/se
$\mathbb{1}_{A_i \geq 11}$	-0.079	-0.072	-0.112	-0.101	-0.117*	-0.106	-0.119*	-0.111*
	(0.065)	(0.065)	(0.080)	(0.082)	(0.068)	(0.068)	(0.067)	(0.067)
LS1	0.003	-0.001	0.009	0.007	0.003	-0.005	0.003	-0.005
	(0.022)	(0.022)	(0.036)	(0.035)	(0.023)	(0.022)	(0.022)	(0.022)
LS2	0.044	0.061	-0.013	-0.035	0.044	0.070	0.044	0.068
	(0.063)	(0.062)	(0.072)	(0.071)	(0.063)	(0.062)	(0.063)	(0.062)
LS3	-0.042*	-0.044**	-0.019	-0.025	-0.013	-0.013	-0.011	-0.010
	(0.021)	(0.022)	(0.037)	(0.039)	(0.024)	(0.026)	(0.023)	(0.024)
LS4	0.034***	0.033***	0.009	0.014	0.014	0.009	0.008	0.005
	(0.007)	(0.007)	(0.033)	(0.034)	(0.026)	(0.026)	(0.016)	(0.017)
male		0.045*		0.044		0.050*		0.049*
		(0.024)		(0.033)		(0.028)		(0.027)
parents' age		-0.001		0.001		0.000		-0.000
		(0.002)		(0.003)		(0.003)		(0.002)
h. school dipl.		-0.106***		-0.155***		-0.150***		-0.134***
		(0.025)		(0.034)		(0.030)		(0.029)
social category (reference: employee)								
farmer		0.118***		0.131***		0.118***		0.120***
		(0.032)		(0.029)		(0.025)		(0.024)
craftsman		-0.072		-0.122		-0.119		-0.124
		(0.087)		(0.108)		(0.099)		(0.099)
executive		0.024		0.040		0.029		0.019
		(0.036)		(0.050)		(0.044)		(0.041)
blue collar		-0.051*		-0.060*		-0.065**		-0.065**
		(0.027)		(0.036)		(0.032)		(0.030)
pensioner		0.209***		0.219***		0.187***		0.190***
		(0.053)		(0.075)		(0.061)		(0.058)
other profession		-0.101		-0.130		-0.068		-0.066
		(0.098)		(0.166)		(0.133)		(0.118)
marital status (reference: married)								
single		-0.008		0.007		-0.063		-0.108
		(0.083)		(0.162)		(0.134)		(0.124)
separate		-0.026		0.022		-0.027		-0.017
		(0.045)		(0.054)		(0.051)		(0.047)
nb of children (reference: one child)								
2		0.031		0.067		0.053		0.038
		(0.033)		(0.051)		(0.045)		(0.042)
3		0.057*		0.099*		0.088*		0.070
		(0.035)		(0.053)		(0.047)		(0.044)
4 and +		-0.013		0.061		0.047		0.020
		(0.053)		(0.073)		(0.062)		(0.060)
R^2	0.038	0.072	0.037	0.102	0.031	0.092	0.031	0.083
AIC	922.762	910.947	462.744	450.950	576.375	557.673	605.733	590.461
N	1100	1100	575	575	717	717	775	775

Note: Standard errors in parentheses. ***Statistically significant at the 1% level; **significant at the 5% level; *significant at the 10% level. Columns 1 and 2 report estimates performed on the whole sample of children. Columns 3 and 4 report estimates obtained using children between 7 and 14 years old (bandwidth of 4). Columns 5 and 6 report estimates obtained using children between 6 and 15 years old (bandwidth of 5). Columns 7 and 8 report estimates obtained using children between 5 and 16 years old (bandwidth of 6). Columns 1, 3, 5 and 7 report estimates without control variables while columns 2, 4, 6 and 8 include them. For the linear spline specification, the variables are defined as follows: $LS1 = \mathbb{1}_{A_i \geq 11}[(A_i - 11)((A_i - 11) < c) + c((A_i - 11) \geq c)]$; $LS2 = ((A_i - 11) \geq 0)(A_i - 11 - c)$; $LS3 = \mathbb{1}_{A_i < 11}[(A_i - 11)(A_i - 11 \geq -c) - c((A_i - 11) < -c)]$; $LS4 = ((A_i - 11) < -c)(A_i - 11 + c)$, with c=3 for the whole sample and bandwidths of 5 and 6, c=2 for bandwidth of 4, due to a smaller sample size. $AIC = N \ln(\hat{\sigma}_\epsilon^2) + 2p$
Source: Health Barometer 1995.

Table A25. Regression Discontinuity on the eldest child sample: Local linear estimates

	Bandwidth=2		Bandwidth=3	
	Dependent variable: hepatitis B vaccination			
	(1)	(2)	(3)	(4)
	b/se	b/se	b/se	b/se
$\mathbb{1}_{A_i \geq 11}$	0.459***	0.511***	0.428***	0.390***
	(0.175)	(0.179)	(0.123)	(0.125)
$\mathbb{1}_{A_i < 11}(A_i - 11)$	-0.055	-0.104	0.004	0.008
	(0.110)	(0.117)	(0.050)	(0.052)
$\mathbb{1}_{A_i \geq 11}(A_i - 11)$	0.237***	0.214**	0.074	0.084
	(0.087)	(0.089)	(0.051)	(0.051)
male		-0.115		-0.070
		(0.076)		(0.064)
parents' age		-0.007		-0.000
		(0.007)		(0.007)
h. school dipl.		-0.090		-0.071
		(0.079)		(0.068)
social category (reference: employee)				
farmer		-0.071		-0.061
		(0.152)		(0.131)
craftsman		0.157		-0.103
		(0.189)		(0.208)
executive		0.110		0.089
		(0.124)		(0.111)
blue collar worker		-0.138		-0.177**
		(0.098)		(0.086)
pensioner		-0.026		-0.106
		(0.356)		(0.269)
other profession		-0.495***		-0.419***
		(0.129)		(0.107)
marital status (reference: married)				
single		0.203		0.212
		(0.230)		(0.229)
separate		0.019		0.006
		(0.159)		(0.122)
nb of children (reference: one child)				
2		-0.161*		-0.113
		(0.096)		(0.085)
3		-0.036		-0.026
		(0.120)		(0.110)
4 and +		-0.295**		-0.360**
		(0.149)		(0.168)
R^2	0.261	0.339	0.255	0.318
AIC	188.821	201.295	265.714	276.013
N	158	158	223	223

Note: Standard errors in parentheses. ***Statistically significant at the 1% level; **significant at the 5% level; *significant at the 10% level. Columns 1 and 2 report estimates performed on the whole sample of children. Columns 1 and 2 report estimates obtained using children between 9 and 12 years old (bandwidth of 2). Columns 3 and 4 report estimates obtained using children between 8 and 13 years old (bandwidth of 3). Columns 1 and 3 report estimates without control variables while columns 2 and 4 include them. $AIC = N \ln(\widehat{\sigma}^2_\epsilon) + 2p$
Source: Health Barometer 1995.

Table A26. Regression Discontinuity on the eldest child sample: Local linear estimates

	Bandwidth=2		Bandwidth=3	
	Dependent variable: MMR vaccination			
	(1)	(2)	(3)	(4)
	b/se	b/se	b/se	b/se
$\mathbb{1}_{A_i \geq 11}$	-0.100	-0.152	-0.169*	-0.219**
	(0.122)	(0.134)	(0.095)	(0.099)
$\mathbb{1}_{A_i<11}(A_i - 11)$	-0.067	-0.034	-0.006	0.009
	(0.061)	(0.072)	(0.036)	(0.041)
$\mathbb{1}_{A_i \geq 11}(A_i - 11)$	0.090	0.067	0.061	0.055
	(0.088)	(0.080)	(0.045)	(0.042)
male		-0.027		-0.005
		(0.068)		(0.051)
parents' age		-0.003		0.002
		(0.006)		(0.005)
h. school dipl.		-0.251***		-0.204***
		(0.068)		(0.054)
social category (reference: employee)				
farmer		0.143		0.090
		(0.102)		(0.073)
craftsman		-0.108		-0.313
		(0.271)		(0.196)
executive		0.065		0.035
		(0.131)		(0.090)
blue collar worker		-0.034		-0.081
		(0.092)		(0.066)
pensioner		0.302*		0.130
		(0.160)		(0.123)
other profession		-0.390		-0.364
		(0.331)		(0.308)
marital status (reference: married)				
single		-0.095		-0.081
		(0.210)		(0.205)
separate		-0.093		-0.055
		(0.127)		(0.087)
nb of children (reference: one child)				
2		0.040		0.097
		(0.090)		(0.075)
3		0.063		0.068
		(0.107)		(0.097)
4 and +		0.165		0.264**
		(0.110)		(0.112)
R^2	0.055	0.191	0.042	0.173
AIC	133.940	139.371	174.861	172.173
N	158	158	223	223

Note: Standard errors in parentheses. ***Statistically significant at the 1% level; **significant at the 5% level; *significant at the 10% level. Columns 1 and 2 report estimates performed on the whole sample of children. Columns 1 and 2 report estimates obtained using children between 9 and 12 years old (bandwidth of 2). Columns 3 and 4 report estimates obtained using children between 8 and 13 years old (bandwidth of 3). Columns 1 and 3 report estimates without control variables while columns 2and 4 include them. $AIC = N \ln(\widehat{\sigma}_{\epsilon}^2) + 2p$
Source: Health Barometer 1995.

B Heterogeneous effects by regions

This section aims at testing if unobserved regional characteristics may affect the evaluation. For example, our results may be driven by a specific region with a particularly high HB disease incidence/low MMR incidence.

First, we show that the distribution of treated and untreated children does not differ per region (see Table A27). Therefore, we do not suspect any systematic bias because of the distribution of children across regions. Second, and more importantly, we test whether there is a heterogeneity of the effect across French regions. Results are presented in Table A28. The size of the impact, both on HB and MMR vaccination rates, is similar in all regions. There is no evidence of any heterogeneity of the impact between regions. This seems to indicate that the impact of the campaign is the same throughout the country and is not affected by, for example, a very high or a very low disease incidence in a specific region.

Table A27. Distribution of treated and untreated children by region

	(1) Whole sample 6-15 yo child	(2) Untreated 6-10 yo	(3) Treated 11-15 yo	(4) T-test 6-15 yo
	Mean	Mean	Mean	b (p-value)
Paris	0.13	0.12	0.14	0.03
				(0.27)
West	0.15	0.13	0.18	0.05
				(0.09)
East	0.10	0.12	0.08	-0.03
				(0.15)
North-West	0.12	0.13	0.10	-0.03
				(0.24)
North-East	0.11	0.12	0.09	-0.04
				(0.10)
South-West	0.12	0.12	0.12	-0.00
				(0.98)
South	0.09	0.07	0.10	0.03
				(0.18)
Center-East	0.12	0.13	0.11	-0.02
				(0.41)
North	0.06	0.05	0.07	0.02
				(0.32)
N	717	370	347	717

Note: Standard errors in parentheses. Results of the test for equal means lead to non significant differences between the treated and untreated groups. Results obtained for children aged between 6 and 15 years old, on the sample composed of all children.
Source: Health Barometer 1995.

Table A28. Local Linear RD estimates using a bandwidth of 5 years around the threshold of 11 years old

	HB outcomes		
	Paris region vs. the rest	East region vs. y.o the rest	West region vs. the rest
	(1)	(2)	(3)
$\mathbb{1}_{A_i \geq 11}$	0.452***	0.424***	0.390***
se	(0.068)	(0.069)	(0.072)
$\mathbb{1}_{A_i \geq 11} \times Region$	-0.300	-0.064	0.180
	(0.209)	(0.209)	(0.176)
Region	0.419**	-0.019	-0.056
	(0.184)	(0.156)	(0.152)
N	717	717	717
	MMR outcomes		
	Paris region vs. the rest	East region vs. y.o the rest	West region vs. the rest
	(1)	(2)	(3)
$\mathbb{1}_{A_i \geq 11}$	-0.135**	-0.168***	-0.147**
se	(0.056)	(0.055)	(0.060)
$\mathbb{1}_{A_i \geq 11} \times Region$	-0.045	0.182	-0.043
	(0.168)	(0.183)	(0.116)
Region	-0.090	-0.126	0.150*
	(0.116)	(0.145)	(0.083)
N	717	717	717

Note: Standard errors in parentheses. ***Statistically significant at the 1% level; **Statistically significant at the 5% level; *Statistically significant at the 10% level. Results obtained for children aged between 6 and 15 years old, on the sample composed of all children. We control for linear trends of age, continuous at the age of 11
Source: Health Barometer 1995.

C Consistency with parents' beliefs on MMR

In this section, we report the main regression using two other variables as outcomes: the probability of believing that MMR is benign and the probability of believing that no MMR vaccination is risky.

Table A29. Regression Discontinuity: MMR is benign

	All	Bandwidth=4	Bandwidth=5	Bandwidth=6
	(1)	(2)	(3)	(4)
	Dependent variable: MMR benign			
	b/se	b/se	b/se	b/se
	Linear			
$\mathbb{1}_{A_i \geq 11}$	0.17**	0.17	0.21**	0.18**
	(0.08)	(0.10)	(0.10)	(0.09)
$\mathbb{1}_{A_i < 11}(A_i - 11)$	-0.02*	-0.02	-0.03	-0.02
	(0.01)	(0.03)	(0.02)	(0.02)
$\mathbb{1}_{A_i \geq 11}(A_i - 11)$	-0.04*	-0.01	-0.04*	-0.04*
	(0.02)	(0.03)	(0.02)	(0.02)
R^2	0.01	0.01	0.01	0.01
AIC	753.25	408.12	516.55	555.51
	Linear Spline			
$\mathbb{1}_{A_i \geq 11}$	0.26**	0.42***	0.28**	0.27**
	(0.12)	(0.15)	(0.12)	(0.12)
LS1	-0.01	-0.07	-0.01	-0.01
	(0.03)	(0.06)	(0.03)	(0.03)
LS2	-0.12	0.13	-0.12	-0.12
	(0.09)	(0.11)	(0.09)	(0.09)
LS3	-0.07	-0.17**	-0.08	-0.08*
	(0.04)	(0.08)	(0.05)	(0.05)
LS4	-0.01	0.14*	0.03	0.02
	(0.01)	(0.08)	(0.06)	(0.04)
R^2	0.02	0.03	0.02	0.02
AIC	754.91	406.14	518.17	556.51
N	558	301	388	418

Note: Standard errors in parentheses. ***Statistically significant at the 1% level; **significant at the 5% level; *significant at the 10% level. Regressions are performed without any control variable. The first column corresponds to the whole sample. Column 2 reports estimates obtained using households whose eldest child is between 7 and 14 years old (bandwidth of 4). Respectively, columns 3 and 4 report the results for households whose eldest child is between 6 and 15 (bandwidth of 5) years old or between 5 and 16 years old (bandwidth of 6). For the linear spline specification, the variables are defined as follows: $LS1 = \mathbb{1}_{A_i \geq 11}[(A_i - 11)((A_i - 11) < c) + c((A_i - 11) \geq c)]$; $LS2 = ((A_i - 11) \geq 0)(A_i - 11 - c)$; $LS3 = \mathbb{1}_{A_i < 11}[(A_i - 11)(A_i - 11 \geq -c) - c((A_i - 11) < -c)]$; $LS4 = ((A_i - 11) < -c)(A_i - 11 + c)$, with c=3 for the whole sample and bandwidths of 5 and 6, c=2 for bandwidth of 4, due to a smaller sample size. $AIC = N \ln(\widehat{\sigma}_\epsilon^2) + 2p$
Source: Health Barometer 1995.

Table A30. Regression Discontinuity: MMR non-vaccination is risky

	All	Bandwidth=4	Bandwidth=5	Bandwidth=6
	(1)	(2)	(3)	(4)
	Dependent variable: MMR non-vaccination is risky			
	b/se	b/se	b/se	b/se
	Linear			
$\mathbb{1}_{A_i \geq 11}$	-0.12	-0.13	-0.20**	-0.18**
	(0.08)	(0.10)	(0.10)	(0.09)
$\mathbb{1}_{A_i<11}(A_i - 11)$	0.01	0.03	0.04	0.03
	(0.01)	(0.03)	(0.03)	(0.02)
$\mathbb{1}_{A_i \geq 11}(A_i - 11)$	0.03	-0.05	0.03	0.03
	(0.02)	(0.03)	(0.02)	(0.02)
R^2	0.00	0.02	0.01	0.01
AIC	753.05	415.37	524.09	565.72
	Linear Spline			
$\mathbb{1}_{A_i \geq 11}$	-0.16	-0.20	-0.14	-0.15
	(0.11)	(0.14)	(0.12)	(0.12)
LS1	-0.05	-0.01	-0.05	-0.05
	(0.03)	(0.05)	(0.03)	(0.03)
LS2	0.28***	-0.12	0.28***	0.28***
	(0.08)	(0.11)	(0.08)	(0.08)
LS3	0.06	0.07	0.04	0.05
	(0.04)	(0.08)	(0.05)	(0.05)
LS4	-0.00	-0.03	0.04	0.02
	(0.01)	(0.09)	(0.06)	(0.04)
R^2	0.02	0.03	0.03	0.03
AIC	746.35	418.52	518.65	560.21
N	562	305	392	422

Note: Standard errors in parentheses, clustered by age of the child. ***Statistically significant at the 1% level; **significant at the 5% level; *significant at the 10% level. Regressions are performed without any control variable. The first column corresponds to the whole sample. Column 2 reports estimates obtained using households whose eldest child is between 7 and 14 years old (bandwidth of 4). Respectively, columns 3 and 4 report the results for households whose eldest child is between 6 and 15 (bandwidth of 5) years old or between 5 and 16 years old (bandwidth of 6). For the linear spline specification, the variables are defined as follows: $LS1 = \mathbb{1}_{A_i \geq 11}[(A_i - 11)((A_i - 11) < c) + c((A_i - 11) \geq c)]$; $LS2 = ((A_i - 11) \geq 0)(A_i - 11 - c)$; $LS3 = \mathbb{1}_{A_i<11}[(A_i - 11)(A_i - 11 \geq -c) - c((A_i - 11) < -c)]$; $LS4 = ((A_i - 11) < -c)(A_i - 11 + c)$, with c=3 for the whole sample and bandwidths of 5 and 6, c=2 for bandwidth of 4, due to a smaller sample size. $AIC = N \ln(\widehat{\sigma}^2_\epsilon) + 2p$
Source: Health Barometer 1995.

D Placebo tests

1 Using the Health Barometers 1992 and 2000

Table A31. Regression Discontinuity using Health Barometer 1992 with a threshold at 11 years old

	All	Bandwidth=4	Bandwidth=5	Bandwidth=6
	(1)	(2)	(3)	(4)
	Dependent variable: MMR vaccination for all children in 1992			
	b/se	b/se	b/se	b/se
	Linear			
$\mathbb{1}_{A_i \geq 11}$	-0.05	0.13	0.13	0.05
	(0.07)	(0.11)	(0.09)	(0.08)
$\mathbb{1}_{A_i<11}(A_i - 11)$	-0.01	-0.08**	-0.06***	-0.04***
	(0.01)	(0.03)	(0.02)	(0.01)
$\mathbb{1}_{A_i \geq 11}(A_i - 11)$	-0.02	0.02	-0.02	0.00
	(0.02)	(0.03)	(0.03)	(0.02)
R^2	0.02	0.02	0.04	0.03
AIC	765.76	384.49	471.80	542.14
	Linear Spline			
$\mathbb{1}_{A_i \geq 11}$	0.22*	0.38**	0.18	0.20
	(0.12)	(0.18)	(0.13)	(0.12)
LS1	0.01	-0.03	0.02	-0.01
	(0.03)	(0.06)	(0.03)	(0.03)
LS2	-0.08	0.14	-0.23*	0.02
	(0.06)	(0.12)	(0.14)	(0.07)
LS3	-0.14***	-0.24**	-0.10**	-0.11**
	(0.04)	(0.10)	(0.05)	(0.04)
LS4	0.01	-0.00	-0.03	-0.01
	(0.01)	(0.04)	(0.03)	(0.02)
R^2	0.04	0.04	0.05	0.04
AIC	755.33	379.98	469.63	542.52
N	693	314	407	477

Note: Standard errors in parentheses. ***Statistically significant at the 1% level; **significant at the 5% level; *significant at the 10% level. Regressions are performed without any control variable. The first column corresponds to the whole sample. Column 2 reports estimates obtained using households whose eldest child is between 7 and 14 years old (bandwidth of 4). Respectively, columns 3 and 4 report the results for households whose eldest child is between 6 and 15 (bandwidth of 5) years old or between 5 and 16 years old (bandwidth of 6). For the linear spline specification the variables are defined as follows: $LS1 = \mathbb{1}_{A_i \geq 11}[(A_i - 11)((A_i - 11) < c) + c((A_i - 11) \geq c)]$; $LS2 = ((A_i - 11) \geq 0)(A_i - 11 - c)$; $LS3 = \mathbb{1}_{A_i<11}[(A_i - 11)(A_i - 11 \geq -c) - c((A_i - 11) < -c)]$; $LS4 = ((A_i - 11) < -c)(A_i - 11 + c)$, with c=3 for the whole sample and bandwidths of 5 and 6, c=2 for a bandwidth of 4, due to a smaller sample size. $AIC = N \ln(\widehat{\sigma}_{\epsilon}^2) + 2p$
Source: Health Barometer 1992.

Table A32. Regression Discontinuity using Health Barometer 2000 with a threshold at 11 years old

	All	Bandwidth=4	Bandwidth=5	Bandwidth=6
	(1)	(2)	(3)	(4)
	Dependent variable: MMR vaccination for the eldest child in 2000			
	b/se	b/se	b/se	b/se
	Linear			
$\mathbb{1}_{A_i \geq 11}$	0.04***	-0.02	-0.01	0.12***
	(0.01)	(0.02)	(0.02)	(0.02)
$\mathbb{1}_{A_i<11}(A_i - 11)$	0.02***	-0.00	-0.00	-0.00
	(0.00)	(0.01)	(0.00)	(0.00)
$\mathbb{1}_{A_i \geq 11}(A_i - 11)$	-0.13***	-0.01	-0.02***	-0.13***
	(0.00)	(0.01)	(0.01)	(0.00)
R^2	0.55	0.01	0.01	0.26
AIC	3136.50	713.35	1030.55	2029.36
	Linear Spline			
$\mathbb{1}_{A_i \geq 11}$	0.04**	0.00	-0.02	-0.04**
	(0.02)	(0.03)	(0.02)	(0.02)
LS1	-0.07***	-0.02*	-0.01	0.03***
	(0.01)	(0.01)	(0.01)	(0.01)
LS2	-0.16***	0.02	-0.05*	-0.42***
	(0.00)	(0.02)	(0.03)	(0.01)
LS3	-0.03***	-0.01	-0.00	-0.00
	(0.01)	(0.02)	(0.01)	(0.01)
LS4	0.02***	0.00	-0.00	-0.00
	(0.00)	(0.01)	(0.01)	(0.00)
R^2	0.56	0.01	0.01	0.39
AIC	2979.78	714.82	1031.83	1173.44
N	7563	3146	3866	4666

Note: Standard errors in parentheses. ***Statistically significant at the 1% level; **significant at the 5% level; *significant at the 10% level. Regressions are performed without any control variable. The first column corresponds to the whole sample. Column 2 reports estimates obtained using households whose eldest child is between 7 and 14 years old (bandwidth of 4). Respectively, columns 3 and 4 report the results for households whose eldest child is between 6 and 15 (bandwidth of 5) years old or between 5 and 16 years old (bandwidth of 6). For the linear spline specification, the variables are defined as follows: $LS1 = \mathbb{1}_{A_i \geq 11}[(A_i - 11)((A_i - 11) < c) + c((A_i - 11) \geq c)]$; $LS2 = ((A_i - 11) \geq 0)(A_i - 11 - c)$; $LS3 = \mathbb{1}_{A_i<11}[(A_i - 11)(A_i - 11 \geq -c) - c((A_i - 11) < -c)]$; $LS4 = ((A_i - 11) < -c)(A_i - 11 + c)$, with c=3 for the whole sample and bandwidths of 5 and 6, c=2 for bandwidth of 4, due to a smaller sample size. $AIC = N \ln(\widehat{\sigma}_\epsilon^2) + 2p$
Source: Health Barometer 2000.

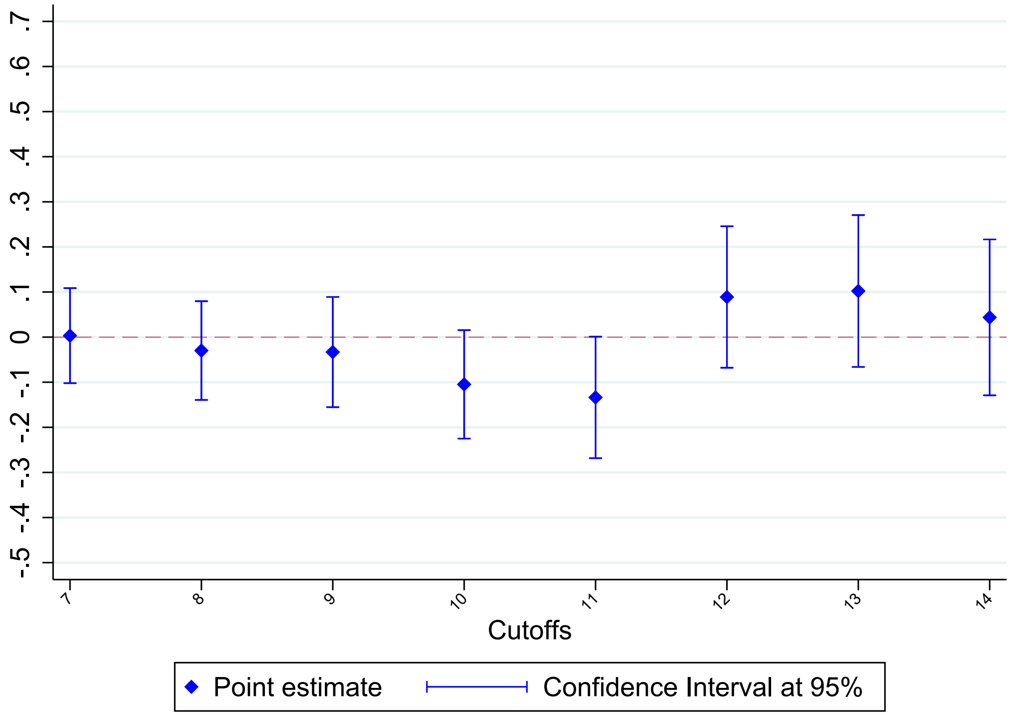
Table A33. Regression Discontinuity using Health Barometer 1992 with a threshold at 8 years old

	All	Bandwidth=4	Bandwidth=5	Bandwidth=6
	(1)	(2)	(3)	(4)
	Dependent variable: MMR vaccination for all children in 1992			
	b/se	b/se	b/se	b/se
	Linear			
$\mathbb{1}_{A_i \geq 8}$	-0.15**	-0.04	-0.07	-0.04
	(0.06)	(0.08)	(0.07)	(0.06)
$\mathbb{1}_{A_i<8}(A_i-8)$	0.02*	-0.01	-0.00	-0.01
	(0.01)	(0.02)	(0.02)	(0.01)
$\mathbb{1}_{A_i \geq 8}(A_i-8)$	-0.02*	-0.05*	-0.03	-0.03*
	(0.01)	(0.03)	(0.02)	(0.02)
R^2	0.03	0.04	0.03	0.04
AIC	755.81	430.12	530.18	580.03
	Linear Spline			
$\mathbb{1}_{A_i \geq 8}$	-0.02	0.04	-0.05	-0.07
	(0.09)	(0.13)	(0.10)	(0.09)
LS1	-0.04	-0.11**	-0.05*	-0.04*
	(0.02)	(0.05)	(0.03)	(0.03)
LS2	-0.01	0.09	0.06	0.00
	(0.02)	(0.10)	(0.09)	(0.06)
LS3	-0.03	-0.04	-0.00	0.01
	(0.03)	(0.07)	(0.04)	(0.03)
LS4	0.04**	0.00	0.00	-0.02
	(0.02)	(0.03)	(0.04)	(0.02)
R^2	0.04	0.04	0.03	0.04
AIC	757.28	430.57	530.86	583.12
N	693	424	513	580

Note: Standard errors in parentheses. ***Statistically significant at the 1% level; **significant at the 5% level; *significant at the 10% level. Regressions are performed without any control variable. The first column corresponds to the whole sample. Column 2 reports estimates obtained using households whose eldest child is between 7 and 14 years old (bandwidth of 4). Respectively, columns 3 and 4 report the results for households whose eldest child is between 6 and 15 (bandwidth of 5) years old or between 5 and 16 years old (bandwidth of 6). For the linear spline specification the variables are defined as follows: $LS1 = \mathbb{1}_{A_i \geq 8}[(A_i-8)((A_i-8) < c) + c((A_i-8) \geq c)]$; $LS2 = ((A_i-8) \geq 0)(A_i-8-c)$; $LS3 = \mathbb{1}_{A_i<8}[(A_i-8)(A_i-8 \geq -c) - c((A_i-8) < -c)]$; $LS4 = ((A_i-8) < -c)(A_i-8+c)$, with c=3 for the whole sample and bandwidths of 5 and 6, c=2 for a bandwidth of 4, due to a smaller sample size. $AIC = N \ln(\widehat{\sigma}_\epsilon^2) + 2p$
Source: Health Barometer 1992.

2 Placebo cut-offs

Figure A34. Point estimates using other cutoffs on the MMR outcome



VI Mechanisms

A Crowding-out effect on MMR

To check whether there is a crowding-out effect of HB vaccination on MMR take-up, we use a fuzzy regression discontinuity design. The estimates are presented in Tables A35 and A36.

Table A35. Fuzzy Regression Discontinuity on the eldest child sample: Local linear estimates

	All		Bandwidth=4		Bandwidth=5		Bandwidth=6	
	Dependent variable: MMR vaccination							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	b/se	b/se	b/se	b/se	b/se	b/se	b/se	b/se
HB Vacc.	-0.562***	-0.557***	-0.274*	-0.343**	-0.307*	-0.313*	-0.312*	-0.312*
	(0.167)	(0.175)	(0.161)	(0.170)	(0.172)	(0.170)	(0.163)	(0.165)
$\mathbb{1}_{A_i<11}(A_i-11)$	0.022***	0.021*	-0.018	-0.014	-0.011	-0.012	-0.010	-0.010
	(0.008)	(0.011)	(0.019)	(0.022)	(0.016)	(0.018)	(0.012)	(0.014)
$\mathbb{1}_{A_i\geq 11}(A_i-11)$	0.035	0.033	0.025	0.020	0.027	0.027	0.027	0.027
	(0.024)	(0.024)	(0.030)	(0.032)	(0.022)	(0.022)	(0.022)	(0.022)
male		0.020		0.017		0.030		0.033
		(0.040)		(0.048)		(0.040)		(0.037)
parents' age		-0.001		0.001		-0.001		-0.002
		(0.004)		(0.005)		(0.004)		(0.004)
h. school dipl.		-0.099**		-0.204***		-0.164***		-0.150***
		(0.041)		(0.051)		(0.043)		(0.040)
social category (reference: employee)								
farmer		-0.065		0.023		0.046		0.038
		(0.094)		(0.075)		(0.068)		(0.068)
craftsman		-0.171		-0.285		-0.200		-0.210
		(0.175)		(0.196)		(0.160)		(0.160)
executive		-0.048		0.029		0.018		-0.019
		(0.077)		(0.091)		(0.078)		(0.072)
blue collar worker		-0.070		-0.115*		-0.063		-0.072
		(0.060)		(0.069)		(0.063)		(0.061)
pensioner		0.063		0.137		0.111		0.106
		(0.151)		(0.108)		(0.107)		(0.105)
other profession		-0.087		-0.422*		-0.169		-0.174
		(0.164)		(0.244)		(0.187)		(0.187)
marital status (reference: married)								
single		-0.050		0.002		-0.031		-0.059
		(0.106)		(0.232)		(0.164)		(0.132)
separate		-0.083		-0.027		-0.092		-0.096
		(0.078)		(0.084)		(0.075)		(0.073)
nb of children (reference: one child)								
2		0.023		0.042		0.003		-0.014
		(0.051)		(0.072)		(0.060)		(0.057)
3		-0.004		0.067		0.021		0.003
		(0.070)		(0.087)		(0.071)		(0.068)
4 and +		0.118		0.156*		0.125*		0.117
		(0.087)		(0.090)		(0.074)		(0.072)
$F-stat$	38.215	31.021	24.084	20.488	22.524	21.201	25.680	22.300
R^2	-0.520	-0.478	-0.149	-0.116	-0.145	-0.072	-0.153	-0.078
AIC	679.679	694.050	283.557	304.736	356.282	360.348	365.722	367.294
N	564	564	306	306	394	394	424	424

Note: Standard errors in parentheses. ***Statistically significant at the 1% level; **significant at the 5% level; *significant at the 10% level. Columns 1 and 2 report estimates performed on the whole sample of children. Columns 3 and 4 report estimates obtained using children between 7 and 14 years old (bandwidth of 4). Columns 5 and 6 report estimates obtained using children between 6 and 15 years old (bandwidth of 5). Columns 7 and 8 report estimates obtained using children between 5 and 16 years old (bandwidth of 6). Columns 1, 3, 5 and 7 report estimates without control variables while columns 2, 4, 6 and 8 include them. $AIC = N\ln(\widehat{\sigma}_\epsilon^2) + 2p$
Source: Health Barometer 1995.

Table A36. Fuzzy Regression Discontinuity on all children: Local linear estimates

	All		Bandwidth=4		Bandwidth=5		Bandwidth=6	
	Dependent variable: MMR vaccination							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	b/se	b/se	b/se	b/se	b/se	b/se	b/se	b/se
HB Vacc.	-0.499***	-0.504***	-0.255*	-0.248*	-0.347**	-0.330**	-0.344***	-0.332***
	(0.120)	(0.119)	(0.132)	(0.128)	(0.139)	(0.134)	(0.129)	(0.126)
$\mathbb{1}_{A_i<11}(A_i-11)$	0.024***	0.026***	-0.010	-0.010	0.005	0.003	0.005	0.004
	(0.006)	(0.007)	(0.016)	(0.016)	(0.014)	(0.014)	(0.011)	(0.012)
$\mathbb{1}_{A_i\geq 11}(A_i-11)$	0.025	0.025	0.006	-0.000	0.021	0.019	0.021	0.019
	(0.019)	(0.019)	(0.025)	(0.025)	(0.018)	(0.018)	(0.018)	(0.018)
male		0.048*		0.037		0.039		0.042
		(0.029)		(0.035)		(0.032)		(0.030)
parents' age		-0.003		-0.001		-0.002		-0.002
		(0.003)		(0.003)		(0.003)		(0.003)
h. school dipl.		-0.108***		-0.163***		-0.156***		-0.137***
		(0.030)		(0.037)		(0.034)		(0.032)
social category (reference: employee)								
farmer		-0.021		0.050		0.052		0.039
		(0.055)		(0.048)		(0.050)		(0.051)
craftsman		-0.098		-0.174		-0.148		-0.167
		(0.114)		(0.119)		(0.114)		(0.114)
executive		-0.054		-0.010		-0.002		-0.030
		(0.051)		(0.058)		(0.057)		(0.054)
blue collar worker		-0.128***		-0.127**		-0.115**		-0.129***
		(0.043)		(0.050)		(0.048)		(0.047)
pensioner		0.096		0.195**		0.125		0.109
		(0.132)		(0.078)		(0.096)		(0.097)
other profession		-0.175		-0.273		-0.151		-0.164
		(0.129)		(0.167)		(0.148)		(0.133)
marital status (reference: married)								
single		-0.093		0.001		-0.089		-0.159
		(0.090)		(0.178)		(0.131)		(0.123)
separate		-0.024		0.008		-0.033		-0.026
		(0.055)		(0.058)		(0.056)		(0.052)
nb of children (reference: one child)								
2		0.010		0.051		0.027		0.007
		(0.040)		(0.055)		(0.050)		(0.048)
3		0.011		0.077		0.053		0.028
		(0.045)		(0.059)		(0.054)		(0.052)
4 and +		-0.031		0.029		0.012		-0.015
		(0.064)		(0.078)		(0.069)		(0.068)
$F-stat$	74.779	71.976	39.532	37.742	41.906	40.959	49.310	47.610
R^2	-0.397	-0.366	-0.119	-0.039	-0.198	-0.119	-0.203	-0.134
AIC	1100	1100	575	575	717	717	775	775
N	564	564	306	306	394	394	424	424

Note: Standard errors in parentheses. ***Statistically significant at the 1% level; **significant at the 5% level; *significant at the 10% level. Columns 1 and 2 report estimates performed on the whole sample of children. Columns 3 and 4 report estimates obtained using children between 7 and 14 years old (bandwidth of 4). Columns 5 and 6 report estimates obtained using children between 6 and 15 years old (bandwidth of 5). Columns 7 and 8 report estimates obtained using children between 5 and 16 years old (bandwidth of 6). Columns 1, 3, 5 and 7 report estimates without control variables while columns 2, 4, 6 and 8 include them. $AIC = N\ln(\widehat{\sigma}^2_\epsilon) + 2p$

Source: Health Barometer 1995.

B Heterogeneity of the crowding-out effect by parental income

Our average (crowding-out) effect is driven by the wealthier individuals.

Table A37. Local Linear Fuzzy RD estimates using a bandwidth of 5 years around the threshold of 11 years old

	MMR outcomes	
	High income vaccination (1)	Low income vaccination (2)
HB Vacc.	-0.48**	-0.02
se	(0.19)	(0.17)
F-stat	24.13	21.33
N	517	215

Note: Standard errors in parentheses. ***Statistically significant at the 1% level; **Statistically significant at the 5% level; *Statistically significant at the 10% level. Results obtained for children aged between 6 and 15 years old, on the sample composed of all children. We control for linear trends of age, continuous at the age of 11.
Source: Health Barometer 1995.

C Physicians' beliefs

The physician's beliefs are consistent with the salience effect on HB vaccination.

Table A38. Physicians beliefs during the 1995 campaign

	Whole sample	Sh. patients < 15 yo			Age	
		< 10%	10 – 50 %	50 – 75 %	-35 yo	+55 yo
% Very favorable to HB vaccination for...						
newborns	17.47	16.4	17.13	11.6	21.1	20
middle school pupils (*6e* in France)	64.56	57.5	63.7	80.8	73.4	61.2
teenagers	85.29	83.1	85.5	96.2	94.5	88.2
the whole population	41.66	40.6	39.8	53.9	46.9	55.3
% who systematically offer MMR vaccination to...						
newborns	83.32	73.5	88.3	92.3	94.5	72.9
children aged 2 to 16 (2nd injection)	39.88	33.8	42.2	46	46.1	32.9
children aged 2 to 16 (both injections)	59.13	52	58.9	76.9	74.2	49.4
Number of obs.	1013	219	751	26	128	85

Source: 1994 Physicians Barometer.

References

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