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Instrumenting education in France: Using May 1968 events as a natural experiment?

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Instrumenting education in France: Using May 1968 events as a natural experiment?[1]

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Abstract

This study analyses the possibility to exploit the events of May 1968 in France as a natural experiment to instrument education. This strategy has been used in Maurin and McNally (2008) to assess both returns to education and intergenerational mobility. We implement a replication exercise and further investigate the validity of the instrument based on alternative data sets. It appears that the specific instrument constructed by Maurin and McNally (2008) is not convincing. We suggest an alternative instrumental variable to verify whether the events of May 1968 qualify at all as a suitable natural experiment. Finally, regardless of the choice of empirical procedure, even if the events of May 1968 increased the rate of success at the *baccalauréat* examination for year 1968, they had no impact on the final level of education – as students had the opportunity to take the examination more than once – and should not be used to instrument it.

Keywords: Natural experiment, education, France

JEL classification: I21, I24, I26

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1 Introduction

Economists have long been interested in the causal effect of education, both when investigating its returns on the labor market and the intergenerational transmission of inequality. They have been confronted to an endogeneity issue, as education is correlated with unobservable characteristics also affecting the variable of interest, income or children's outcome. In particular not taking into account the ability-bias yields OLS estimates to be upwardly biased (Blackburn and Neumark, 1993). In order to control for this endogeneity bias, one approach is to exploit exogenous sources of variation in education deriving from natural experiments.

Regarding returns to education, Angrist and Krueger (1991, 1992) as well as Leigh and Ryan (2008) use age at school entry and compulsory schooling laws. Minimum school leaving age (MSLA) reforms are also used by Acemoglu and Angrist (1999), Meghir and Palme (2005), Oreopoulos (2006) and Aakvik et al. (2010). Alternatively, Ichino and Winter-Ebmer (2004) exploit children's educational loss caused by their father being at war and Gurgand and Maurin (2007) the strong educational expansion after WWII in France. Butcher and Case (1994) use the number and sex composition of the siblings and Duflo (2000) exploits school construction. For the intergenerational transmission of inequality, MSLA reforms are widely used, in particular by Chevalier (2004), Black et al. (2005), Oreopoulos et al. (2006), Holmlund (2006) and Holmlund et al. (2011). Alternatively Carneiro et al. (2013) use changes in school costs and Currie and Moretti (2003) the availability of colleges.

Concerning the use of natural experiments, issues have been highlighted since Angrist and Krueger (1991) received many critics about their instrumental method, in particular from Bound and Jaeger (1996, 2000). Indeed as seen in Bound et al. (1995), when using a weak instrument even a small correlation between the instrument and the error term in the original estimation can lead to large inconsistencies in the IV estimates. In any case, Bound et al. (1993, 1995) and Staiger and Stock

(1997) strongly recommend to always provide the F-statistics associated with the first stage estimations to assess the quality of the instrument. As an additional concern, contrary to random control trials, in natural experiments the treatment and control groups may not be comparable even if random assignment is assumed, as detailed in Sekhon and Titiunik (2012), which invalidates the identification.

In France, Grenet (2013) and Maurin and McNally (2008) use natural experiment methods to instrument education. Grenet (2013) uses the increase from 14 to 16 years old of the MSLA induced by the Berthoin Law to estimate the returns to education. Maurin and McNally (2008) exploit the events of May 1968 to investigate both returns to education and intergenerational mobility. During spring 1968, a wave of student protests escalated into a general strike. It led among others to important modifications in examination modalities, especially for the high school certification, called *baccalauréat* in France. Consequently more high schoolers graduated this year and thus had the opportunity to have access to higher education. The authors use these modifications in examination modalities following the events of May 1968 in France to investigate the returns to education and the intergenerational transmission of education. They argue that "unlike all other papers in the literature, the intervention is a one-off, unexpected, and temporary: it has no consequences for cohorts coming after 1968 events, and the incentive structure of the educative system is unchanged" and conclude that the events thus fit the prerequisites of a convincing natural experiment.

However we have some concerns regarding the nature of the events of May 1968 and the context in which they happened, as well as more specifically the strategy implemented in Maurin and McNally (2008). First of all we suspect a slight impact of the events on education, since only a limited number of students who would not have passed otherwise graduated from high school thanks to the events. Indeed for most of students there was no effect, neither on low-performing students who even in this context did not obtain the *baccalauréat*, nor on high-performing students who would

have graduated anyways. Furthermore the modification of the examination modalities were not the only change occurring at this time. A new type of *baccalauréat* was created in 1968 (with a first session in 1969) as an alternative to the existing *baccalauréat général*: the *baccalauréat technologique*. The former consists of general studies, whereas the latter is more job-oriented. This new orientation possibility changed the composition of the population of university students, as high schoolers now had the opportunity to select a shorter, vocational path (see Cappellari and Lucifora (2009) for a change in the higher education structure in Italy).

Regarding the specific method of Maurin and McNally (2008), our first doubt concerns the instrumental variable. They choose the birth cohort of 1949 as the population treated by the events of May 1968, since the median age of *baccalauréat* candidates was 19 at this time (the standard age to take the examination is 18, but half of pupils repeated at least one grade in primary school). However this measure does not accurately target the affected population, since part of individuals born in 1949 took the examination another year and individuals born years prior or subsequent to 1949 took the examination in 1968 (in particular individuals born in 1950, who were candidates at age 18). Besides Maurin and McNally (2008) find IV estimates much higher than the OLS ones. On wages, the ratio is about 1.5 and on children's education (grade repetition) more than 4. About this last finding, the authors argue that their "results are qualitatively similar to Oreopoulos et al. (2006) in that larger effects are estimated when using the IV approach". In the cited study, IV estimates are however only almost twice the size of the OLS ones. All of the above raises weak instrument concerns, which can not be dismissed as the authors do not extensively discuss the first stage estimations, nor the F-statistics.

Our contribution is first to reveal that the variable used in Maurin and McNally (2008) – being born in 1949 – is not a valid instrument for education. Second and more generally, we show that the events of May 1968 – even when represented by the year of *baccalauréat* examination – do not qualify as a cogent natural experiment.

We start by replicating the estimations of Maurin and McNally (2008), using the same empirical procedure on Labor Force Survey (LFS) data. We report first stage estimates and F-statistics as well as OLS and IV results, as in Maurin and McNally (2008), for the main strategy and for alternative specifications. The results obtained confirm our weak instrument concerns. To check whether this is due to small sample size, we reproduce the same estimations on Census data. However the instrument fails at the placebo tests. Since we excluded the use of birth year 1949 as an instrument, we move on to the year of *baccalauréat* examination, available in the Education-Training-Employment (FQP) survey. Indeed even though being born in 1949 proves to be an unsuitable instrument, the events of May 1968 could still be used as a natural experiment, and having taken the *baccalauréat* examination in year 1968 is a better reflection of having been affected. Nonetheless, using FQP data, we show that since students had the opportunity to take the examination more than once by repeating grades, the events only increased the rate of success in year 1968 but not the final level of education of the treated population. All in all we conclude that the events of May 1968 do not constitute a relevant natural experiment to instrument education.

The remainder of this paper is organized as follows. Section 2 presents the events of May 1968 and the context in which they took place, as well as the changes they brought to the French educational system. Section 3 explains the strategy implemented, through the estimation and sampling procedures and the description of the different data sets used (LFS, Census and FQP). Section 4 presents the replication results obtained from LFS data and Section 5 the comparable results obtained from alternative data sets. Finally, we conclude in Section 6.

2 May 1968 events: context and aftermath

In order to instrument education, Maurin and McNally (2008) use the events of May 1968 as a natural experiment, to obtain an exogenous variation in education. In France, during spring 1968, a general strike initiated by a wave of student protests paralyzed the entire country. It all started with the protestation of a small group of students reacting to the arrest of fellow students during an anti-Vietnam War demonstration. It then rapidly escalated into a massive student riot centered around student condition considerations. Following the violent repression of the movement by police forces – yielding hundreds of severely injured people – the main labor unions decided to join the protest and called a general strike. About 10 million workers stopped working, factories and universities were closed or occupied, leading to negotiations with the government.

The movement took an end with the signature of agreements taking account of labor force and student demands. The evaluation conditions for high school and university examinations were a focal point of the student negotiations. Indeed this school year had been profoundly disturbed for all students, involved or not in the revolt. Many universities decided to delay and/or revise their examinations, but certainly the most important modification affected the national examination of the *baccalauréat*. This high school certification, taking place every year in June, ends the secondary education and guarantees access to universities, so to speak free of charge in France.

The negotiations following the events of May 1968 led to a half day of only oral examinations, instead of the usual week-long almost all-written examinations. Additionally, high school students were given their results right after the examination, hence examiners could not coordinate with one another to bring grades into line, as the procedure normally requires. In all likelihood these changes affected students only positively, among others because professors relied more on school reports.[3]

[3]School reports constitute a decision-making tool for the *baccalauréat* jury. Filled by professors

As a result, for the entire student population (men and women) in 1968 the rate of success was almost 20 percentage points higher (59.6% in 1967, 81.3% in 1968, and 66.0% for all *baccalauréats* and 67.6% for the *baccalauréat général* in 1969[4]) and the proportion of *bacheliers* in a generation – as defined by the Ministry of Education – was around 4 percentage points higher (15.4% in 1967, 19.6% in 1968, and 16.1% for all *baccalauréats* and 14.4% for the *baccalauréat général* in 1969).[5] Indeed in Figure 1 displaying the proportion of *bacheliers* in a generation, one can see a peak for year 1968. However if the proportion of *baccalauréat général* comes back to its value of 1967 in 1970, the proportion of all types of *baccalauréats* is already as high as in 1968 in 1970.

Maurin and McNally (2008) display the trends in the number of *bacheliers*, again for men and women, using data from the French Ministry of Education, and in cohort size, using data from the French Statistical Office INSEE (see Figure 7 in appendix, extracted from Maurin and McNally (2008)) by year of examination (year t corresponding to birth year $t-19$ as 19 is the median age for the candidates). They observe a clear and unique peak for year 1968, with a rate of *bacheliers* returning just after the events to its preceding value. Overall the events of May 1968, and more specifically the modification of the examination's modalities this year, seem to provide an interesting source of exogenous variation in education. As such Maurin and McNally (2008) conclude that it constitutes a favorable framework to implement natural experiment methods.

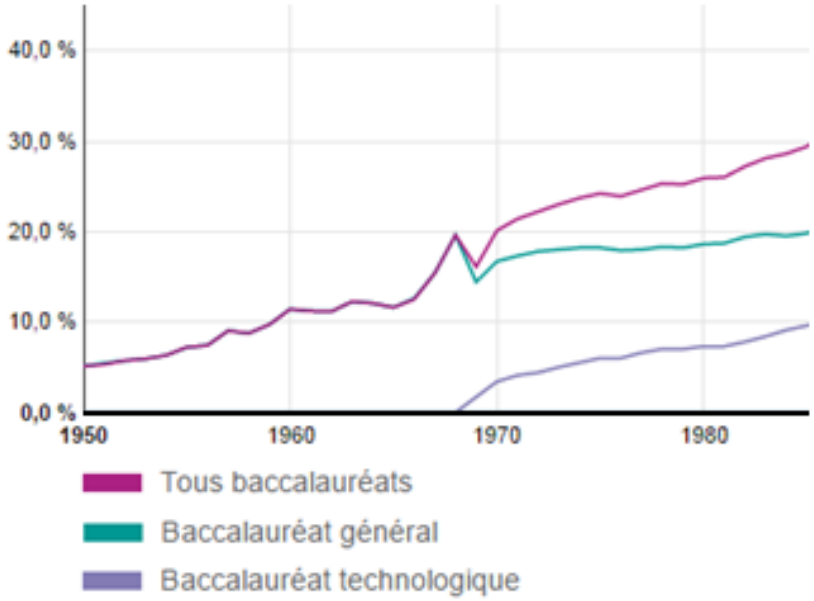
To start off the replication of the study of Maurin and McNally (2008), we plot in Figure 2 the trends in cohort size and number of *bacheliers* by year of examination, for both men and women, using the same specification and data source (see Table 11 in appendix for detailed statistics about the *baccalauréat* examination year by

during school year, they record a student's knowledge and progress. In particular they can be used during deliberations for students whose examination results are just below the admission threshold.

[4]Technological *baccalauréats* were created in 1968 and the first session took place in 1969, as seen in Figure 1. The original *baccalauréat* became the *baccalauréat général* as it consists of general studies. The technological *baccalauréat* (*baccalauréat technologique*) however is more job-oriented.

[5]Source: French Ministry of Education.

Figure 1: Proportion of *bacheliers* in a generation

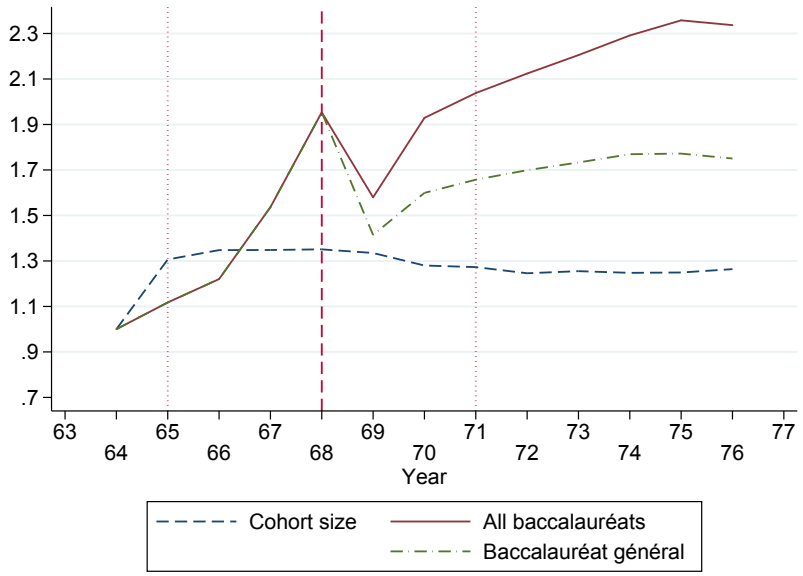


- Note: *"Tous baccalauréats"* stands for "All types of high school certificates", *"Baccalauréat général"* for "General high school certificate" and *"Baccalauréat technologique"* for "Technological high school certificate".
- Definition of the proportion of *bacheliers* in a generation: proportion of *bacheliers* of a fictive generation of individuals who would have, for each age, the participation and success rates observed the considered year. This number is obtained by calculating for each age the proportion of *baccalauréat* owners in the total population of this age, and by summing these rates by age.
- Source: "07. Le baccalauréat et les bacheliers" in "L'état de l'Enseignement supérieur et de la Recherche en France n°9 - June 2016", Ministry of Education.

year, from 1945 to 1953). First, we thus consider all kinds of *baccalauréats*, but do not find the same pattern as the authors. The proportion of *bacheliers* in 1970 is already back to the value of 1968, which does not correspond to the findings of Maurin and McNally (2008), for whom the value in 1970 is close to the one of 1967. The solid line in Figure 2 follows the same pattern as the proportion for "Tous baccalauréats" in Figure 1, whereas the proportions depicted in Figure 7 seem a lot closer to the pattern for "Baccalauréat général". Therefore we also depict the trends in the number of *baccalauréat général*, the dashed line in Figure 2. The shape of this dashed line indeed looks like the one for "Baccalauréat général" in Figure 1, as the one of Maurin and McNally (2008).

It seems that Maurin and McNally (2008) actually show the trends for the *bac-*

Figure 2: Trends in the number of individuals passing the *baccalauréat* and *baccalauréat général* and in cohort size



Source: French Ministry of Education (number of *baccalauréats*) and French Statistical Office INSEE (cohort size). As in Maurin and McNally (2008), the size of the cohort for year t corresponds to the number of persons born at $t - 19$ (19 is the median age for the candidates) and the two series are normalized to 1 for 1964. This Figure corresponds to Figure 1 in Maurin and McNally (2008).

calauréat général and not for all kinds of *baccalauréat*, which is however not specified in their paper. As the peak for the *baccalauréat général* corresponds more to a temporary event (not affecting the following years), one can wonder whether it constitutes a better educational variable of interest than all kinds of *baccalauréat*. However from 1969 – year of the first session of the *baccalauréat technologique* – people who otherwise would have taken a (*général*) *baccalauréat*, as well as people who otherwise would not have taken the *baccalauréat*, have the opportunity to choose a *baccalauréat technologique* instead. Thus it is not clear to which educational variable the situation prior to 1969 should be compared: *baccalauréat général* or all kinds.

Additionally as opposed to what is argued in Maurin and McNally (2008), the events of May 1968 are not temporary (at least concerning all kinds of *baccalauréats*), they had consequences for cohorts coming after 1968 and the incentive structure of the educative system changed, in particular due to the creation of the *baccalauréat*

technologique and the Faure law.[6] These considerations question the validity of the events of May 1968 as a favorable framework to implement natural experiment methods. To our understanding and based on the descriptive statistics presented, Maurin and McNally (2008) seem to include all types of *baccalauréats* in their estimations (and not only the *baccalauréat général*). We will both replicate their analysis and investigate the differences observed using either all kinds of *baccalauréats* or only the *baccalauréat général*.

3 Method and data

3.1 Estimation strategy

To evaluate whether the events of May 1968 had an impact on education and thus qualify as a natural experiment to instrument it, we consider the following first stage equation:

$$Y = \alpha_1 May68 + \alpha_2 X + \epsilon,$$

where Y represents education level, and X is a set of control variables. We use different educational outcomes: having a *baccalauréat*, having a university diploma or degree and the number of years of higher education. Indeed not only the success at the end of high school but also the following higher education should be affected by the events of May 1968, maybe not to the same extent. Since French universities do not select first year students and are nearly free of charge, graduating from high school guarantees the opportunity to access higher education.

$May68$ is a dichotomous variable equal to 1 if the individual is affected by the events, 0 if not. An individual is considered affected by the events of May 1968 if he/she took the *baccalauréat* examination in 1968. However, the year a student takes

[6]The Faure law was passed in the aftermath of the events, on November 1968, when Edgar Faure was Minister of Education. It shifted the role played by higher education in France, placed more emphasis on formation and training of universities' students, gave greater autonomy to the universities and yielded a democratic management of the university.

this examination is not available in all datasets, but only in data from FQP surveys (among the datasets we use). Thus with FQP data, we can use the year a student takes the *baccalauréat* examination as an instrumental variable for education.

Alternatively, using data from each dataset (LFS, Census and FQP for comparative reasons), we use birthyear 1949 as the instrument, as in Maurin and McNally (2008). The median age at which the *baccalauréat* examination was taken in France is 19 years old.[7] This is why we consider as affected by the events of May 1968 people born in 1949. Moreover, we do not particularly expect high performing students to be affected by the events, as they would have passed without any relaxation of the examination conditions. We anticipate a greater impact of the events on less performing students, typically those who repeated a grade.

3.2 Samples and descriptive statistics

3.2.1 Replication of Maurin and McNally (2008)

To perform the replication exercise, the first dataset used here comes from the Labor Force Survey (LFS), as in Maurin and McNally (2008). The LFS is a nationally representative sample of individuals aged 15 and above. Maurin and McNally (2008) use only the waves 1990, 1993, 1996 and 1999 of the LFS since the sample rotates every three years (the same individuals are thus interviewed three years in a row) and they want to observe each individual only once. They justify using data starting from 1990 by the need of information on wages (to estimate the returns to education), only available from this time onwards. They focus on male workers born between 1946 to 1952. We apply the same sampling strategy and report comparable descriptive statistics in Table 1, as well as for all men.

Different education outcomes are considered. Regarding education dummies, "Less than *baccalauréat*" corresponds to individuals who do not hold a high school

[7]French students start school at age 6 and complete 12 years of education by the end of high school so that the standard age to take the *baccalauréat* examination is 18. However at that time half of the student population repeated at least one grade during primary education.

Table 1: Descriptive statistics in Maurin and McNally (2008) and replicated using LFS

	Maurin & McNally		**Baguet & Lecavelier**			
	Male wage earners		Male wage earners		All men	
	Mean	(Std. Dev.)	Mean	(Std. Dev.)	Mean	(Std. Dev.)
Cohort dummy						
1946	0.128	(0.33)	0.128	(0.33)	0.133	(0.34)
1947	0.140	(0.35)	0.140	(0.35)	0.144	(0.35)
1948	0.145	(0.35)	0.146	(0.35)	0.148	(0.35)
1949	0.148	(0.35)	0.148	(0.35)	0.146	(0.35)
1950	0.145	(0.35)	0.145	(0.35)	0.145	(0.35)
1951	0.145	(0.35)	0.145	(0.35)	0.142	(0.35)
1952	0.148	(0.35)	0.148	(0.35)	0.143	(0.29)
Education dummy						
Less than *Baccalauréat*	0.718	(0.45)	0.722	(0.45)	0.728	(0.44)
Baccalauréat only	0.096	(0.29)	0.097	(0.30)	0.094	(0.29)
University diploma	0.074	(0.26)	0.073	(0.26)	0.068	(0.25)
University degree	0.111	(0.31)	0.108	(0.31)	0.111	(0.31)
Years of higher education	1.440	(2.47)	1.408	(2.45)	1.398	(2.45)
Wage (log)	9.170	(0.43)	9.176	(0.50)		
Observations	26,371		26,293		36,629	

Source: LFS 1990, 1993, 1996 and 1999.

Sample: Male wage earners/men born between 1946 and 1952.

Specification: "Years of higher education" equals 0 for "Less than *baccalauréat*", 3 for "*Baccalauréat* only", 5 for "University diploma" and 7 for "University degree".

Replication: This table corresponds to Table 1 in Maurin and McNally (2008).

degree, "*Baccalauréat* only" corresponds to individuals who only hold a high school degree but no higher education, a "University diploma" corresponds to a higher education diploma obtained two years after the *baccalauréat* and a "University degree" corresponds to any higher education degree obtained minimum three years after the *baccalauréat*. The number of years of higher education is not directly available in the LFS, so we construct this variable based on the highest degree obtained by the individual, following Maurin and McNally (2008): "Years of higher education" equals 0 for "Less than *baccalauréat*", 3 for "*Baccalauréat* only", 5 for "University diploma" and 7 for "University degree".

Overall our sample of 26,293 male workers seems very similar to the one of 26,371 male workers in Maurin and McNally (2008). The repartition in the birth cohort groups is equivalent in both samples. Concerning the education level, the repartition is also the same, at 0.4 percentage points at most. We find a slightly lower average

and standard deviation of years of higher education (1.440 (2.47) in Maurin and McNally (2008) versus 1.408 (2.45) here). The average and standard deviation of log wage are slightly higher in our sample (9.176 (0.50) versus 9.170 (0.43)). As for the sample of 36,629 men (not only wage earners), individuals with less than a *baccalauréat* or at least a university degree are more represented. Indeed among non-wage earners we now include in the sample some high education professions (for instance private practice doctors, lawyers, architects, ...), but also many lower education occupations (for instance craftspeople, storekeepers, farmers, ...). As a result the average number of years of higher education is slightly lower.

Due to the creation of the *baccalauréat technologique* in 1969, we expect the effect of the events of May 1968 to be stronger on the *baccalauréat général*. Thus we also construct two alternative educational dummy variables: equal to 1 if the individual has at least a *baccalauréat* – either any kind or a *baccalauréat général* – 0 otherwise. The descriptive statistics relative to these variables are presented in Table 12 in appendix.

3.2.2 Alternative datasets: Census and FQP

To further investigate the validity of the events of May 1968 as an instrument for education, we use Census data to observe the French population as a whole, as we expect only a small proportion of the population to have been affected. The second dataset used in this paper comes from the French Census of 1999, which is the last wave of entire population survey in France. After that, the French Census becomes an annual survey from 2004 on, with approximately 8% of housing surveyed each year. This database contains both birth year and education level, which allows us to perform our first stage regression on a large sample.

Census data do not contain any information neither on wage nor on the year students have taken their examinations. Thus we select men born between 1946 and 1952 and use birth year 1949 as our instrument. The educational outcomes are the

same as in Maurin and McNally (2008) and in our replication using LFS, in Section 3.2.1.

We also use data from the FQP survey, which targets 18 to 65 years old individuals. As a detailed educational calendar is provided since the survey of 1993, we use the waves 1993 and 2003. We do not exploit the wave 2014 as surveyed individuals are too young to be part of our sample. The year students take their examinations being available, we are able to assess the impact of taking the *baccalauréat* examination in 1968 on the probability of success for men born between years 1946 and 1952. Additionally, for comparison purposes we again evaluate the effect of birth year 1949 on education, investigating the same educational outcomes as with LFS and Census data.

For both Census and FQP datasets, descriptive statistics for the two alternative educational dummy variables – at least a *baccalauréat* and at least a *baccalauréat général* – are reported in Table 12 in appendix.

Table 2: Descriptive statistics using Census and FQP

	Census		**FQP**	
	Mean	(Std. Dev.)	Mean	(Std. Dev.)
Cohort dummy				
1946	0.137	(0.344)	0.145	(0.352)
1947	0.143	(0.351)	0.147	(0.354)
1948	0.145	(0.352)	0.158	(0.365)
1949	0.146	(0.353)	0.139	(0.346)
1950	0.146	(0.353)	0.150	(0.357)
1951	0.141	(0.348)	0.128	(0.334)
1952	0.142	(0.349)	0.134	(0.340)
Education dummy				
Less than *Baccalauréat*	0.699	(0.459)	0.751	(0.432)
Baccalauréat only	0.113	(0.317)	0.105	(0.306)
University diploma	0.071	(0.256)	0.050	(0.217)
University degree	0.117	(0.322)	0.094	(0.217)
Years of higher education	1.514	(2.499)	1.223	(2.304)
Observations	2,488,383		4,828	

Source: Census 1999 and FQP 1993 and 2003.

Sample: Men born between 1946 and 1952.

Specification: "Years of higher education" equals 0 for "Less than *baccalauréat*", 3 for "*Baccalauréat* only", 5 for "University diploma" and 7 for "University degree".

As reported in Table 2, the sample constructed with Census data contains 2,488,383 men. Among these men, 69.9% have less than a *baccalauréat*, 11.3% have only a *baccalauréat*, 7.1% have a university diploma and 11.7% a university degree. The corresponding rates for the FQP sample of 4,828 men are 75.1%, 10.5%, 5.0% and 9.4% respectively. The rate of men without a *baccalauréat* is lower in the Census sample than in LFS and FQP samples, whereas the rates for all other education dummies are higher. When comparing the FQP sample to the LFS sample, the rates for a *baccalauréat* or less are higher and the rates for more than a *baccalauréat* are lower. Additionally, in the FQP sample of 1,130 men who ever took the *baccalauréat* examination, 87.7% succeeded in obtaining it (either at first try or by repeating the last year of high school).

4 Replication of Maurin and McNally (2008) using the LFS

4.1 Impact of birth year 1949 on education and wage

In Section 2, we presented in Figure 2 the proportion of *bacheliers* by year of examination using data from the French Ministry of Education. Following the idea that being born in 1949 is a good representation of taking the *baccalauréat* examination in 1968 (and thus being affected by the events of May 1968), we display in Figure 3 the proportion of men who have at least a *baccalauréat* by birth year, from 1939 to 1959, using LFS data. Again we distinguish all men from wage earners. There is an increasing trend and a small – but not unique – peak for birth year 1949. Besides the peak is lower when considering all men and not only wage earners.

Maurin and McNally (2008) start by assuming that education varies in a non-linear way across birth cohorts. They regress educational outcomes and log wages on cohort dummies, for a sample of male workers born between 1946 and 1952. We

Figure 3: Proportion of individuals passing the *baccalauréat* among all men and male wage earners born from 1939 to 1959 using LFS

Source: LFS 1990, 1993, 1996 and 1999.

replicate the same estimations and both sets of results are reported in Table 3.

We are able to accurately reproduce the results of Maurin and McNally (2008) for each first stage educational outcome – *baccalauréat* only, at least a university diploma or degree and the number of years of higher education – as well as for log wage, for the reduced form. When our estimates slightly deviate from the ones of Maurin and McNally (2008), they are not significant (neither for our estimations nor for theirs).

Maurin and McNally (2008) then choose to construct an instrumental variable – further referred to as $May68$ – equal to 1 when the individual is born in 1949 and 0 when the individual is born either in 1946 or 1952. They select the symmetrical birth cohorts of 1946 and 1952, arguing that they are less likely affected by the events of May 1968 than the years in between, closer to 1949. As endogenous educational variable, they use the number of years of higher education.

The authors do not discuss the quality of their instrument and do not explicitly report the F-statistics. These F-statistics still can be obtained as they equal the

Table 3: Impact of birth year on education and labor market outcomes in Maurin and McNally (2008) and replicated using LFS

	First stage				Reduced form
	Baccalauréat only	University diploma at least	University degree at least	Years of higher education	Log wage
	(1)	(2)	(3)	(4)	(5)
Maurin & McNally					
1947	-0.009 (0.006)	0.014 (0.008)	0.008 (0.006)	0.060 (0.050)	0.006 (0.010)
1948	0.007 (0.006)	0.015 (0.008)	0.012 (0.006)	0.080 (0.050)	0.031 (0.010)
1949	-0.001 (0.006)	0.027 (0.008)	0.009 (0.006)	0.150 (0.050)	0.021 (0.010)
1950	0.001 (0.006)	0.008 (0.008)	-0.002 (0.006)	0.030 (0.050)	0.005 (0.010)
1951	-0.005 (0.006)	0.002 (0.008)	-0.001 (0.006)	0.010 (0.050)	0.003 (0.010)
Trend	-0.000 (0.001)	0.001 (0.008)	-0.001 (0.001)	0.005 (0.010)	0.010 (0.002)
Age	-0.000 (0.001)	0.001 (0.008)	-0.000 (0.001)	0.004 (0.005)	0.023 (0.001)
Observations	26,370	26,370	26,370	26,370	26,370
Baguet & Lecavelier					
1947	-0.009 (0.007)	0.014 (0.008)	0.009 (0.007)	0.060 (0.054)	0.003 (0.011)
1948	-0.008 (0.006)	0.014 (0.008)	0.011 (0.006)	0.007 (0.050)	0.035 (0.010)
1949	-0.001 (0.006)	0.027 (0.008)	0.009 (0.006)	0.150 (0.049)	0.022 (0.010)
1950	-0.001 (0.006)	0.008 (0.008)	-0.003 (0.006)	0.029 (0.050)	0.006 (0.010)
1951	0.001 (0.006)	-0.001 (0.008)	-0.003 (0.007)	-0.007 (0.051)	0.004 (0.010)
Trend	-0.000 (0.001)	0.003 (0.002)	0.001 (0.001)	0.014 (0.011)	0.010 (0.002)
Age	-0.000 (0.001)	0.002 (0.001)	0.001 (0.001)	0.011 (0.005)	0.023 (0.001)
R-squared	0.000	0.001	0.001	0.001	0.026
Observations	26,293	26,293	26,293	26,293	26,293

Source: LFS 1990, 1993, 1996 and 1999.

Sample: Male wage earners born between 1946 and 1952.

Specification: Coefficients for birth year dummies 1947 to 1951 are relative to the comparison birth years of 1946 and 1952.

Replication: This table corresponds to Table 4 in Maurin and McNally (2008).

t-statistics squared, in the case of a unique instrument, and the t-statistics can be computed from the estimates and standard errors, however approximated. We computed this effect of $May68$ on having a *baccalauréat* only, having any university diploma or degree and the number of years of higher education, both for wage earners and all men, as seen in Table 4.

The results of columns (1) and (4), on *baccalauréat* only, are not statistically significant. Concerning column (2) (resp. (5)), being born in 1949 (versus 1946 or 1952) increases the likelihood of having a university diploma or degree by about 3 (resp. 2) percentage points, which corresponds to a probability of around 21% (resp. 20%), instead of 18%. However the F-statistic is only at 12.34 for wage earners and at 11.01 for all men, above but not far from the admitted threshold for weak instrument (F-statistic at 10).

Columns (3) and (6) respectively show individuals born in 1949 present 0.15 and 0.12 additional years of higher education, compared to individuals born in 1946 or

Table 4: First stage estimations: Effect of $May68$ on education outcomes for male wage earners and all men using LFS

	Male wage earners			**All men**		
	Baccalauréat only	University diploma or degree	Years of higher education	*Baccalauréat* only	University diploma or degree	Years of higher education
	(1)	(2)	(3)	(4)	(5)	(6)
$May68$	-0.001	0.027***	0.150***	-0.003	0.022***	0.118***
	(0.006)	(0.008)	(0.049)	(0.005)	(0.006)	(0.042)
Birth year	0.001	0.004**	0.027**	0.001	0.003*	0.020**
	(0.001)	(0.002)	(0.012)	(0.001)	(0.002)	(0.010)
F-stat	0.01	12.34	9.52	0.33	11.01	8.09
R-squared	0.000	0.002	0.002	0.000	0.001	0.001
Observations	11,145	11,145	11,145	15,433	15,433	15,433

Source: LFS 1990, 1993, 1996 and 1999.

Sample: Male wage earners/men born in 1946, 1949 and 1952.

Specification: $May68$ equals 1 if the individual is born in 1949, 0 if the individual is born in 1946 or 1952.

Significance levels : $*$: 10% $**$: 5% $***$: 1%

1952. So the effect of $May68$ on the number of years of higher education is significant but small. However the F-statistic are only 9.52 and 8.09, thus stand below the weak instrument threshold. These results raise the question of the validity of being born in year 1949 as an instrument.

Thus the impact of the instrument on educational outcomes is limited for men. In Figure 1, we observed a peak in the rate of *bacheliers* in year 1968 for the entire student population (men and women). We compute the same estimation on the female sample, as reported in Table 5. Surprisingly, being born in 1949 versus 1946 or 1952 does not have a significant impact on any educational outcome. This strengthens our doubts regarding the instrument.

4.2 OLS and IV estimations

We pursue the replication exercise by computing the same OLS and IV estimations as in Maurin and McNally (2008): the effect of the number of years of higher education on wages, instrumented by $May68$. Both sets of results are presented in Table 6 and are similar.

Table 5: First stage estimations: Effect of $May68$ on education outcomes for women using LFS

	Female wage earners			**All women**		
	Baccalauréat only	University diploma or degree	Years of higher education	*Baccalauréat* only	University diploma or degree	Years of higher education
	(1)	(2)	(3)	(4)	(5)	(6)
$May68$	-0.007	-0.002	-0.038	-0.007	-0.000	-0.027
	(0.007)	(0.009)	(0.053)	(0.005)	(0.006)	(0.038)
Birth year	0.004***	0.005**	0.035***	0.003**	0.007***	0.044***
	(0.002)	(0.002)	(0.013)	(0.000)	(0.001)	(0.009)
F-stat	0.99	0.05	0.53	1.79	0.00	0.48
R-squared	0.001	0.001	0.001	0.000	0.001	0.002
Observations	9,624	9,624	9,624	15,954	15,954	15,954

Source: LFS 1990, 1993, 1996 and 1999.

Sample: Female wage earners/women born in 1946, 1949 and 1952.

Specification: $May68$ equals 1 if the individual is born in 1949, 0 if the individual is born in 1946 or 1952.

Significance levels : $*$: 10% $**$: 5% $***$: 1%

Table 6: Evaluation of the returns to education in Maurin and McNally (2008) and replicated using LFS

	Maurin & McNally		**Baguet & Lecavelier**	
	Log wage		Log wage	
	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)
Years of higher education	0.094	0.140	0.096	0.145
	(0.002)	(0.060)	(0.002)	(0.060)
Birth year	0.010	0.010	0.102	0.009
	(0.002)	(0.002)	(0.002)	(0.003)
Age	0.023	0.023	0.023	0.022
	(0.001)	(0.002)	(0.001)	(0.002)
R-squared	0.25		0.25	
Observations	11,171	11,171	11,145	11,145

Source: LFS 1990, 1993, 1996 and 1999.

Sample: Male wage earners born in 1946, 1949 and 1952.

Specification: $May68$ equals 1 if the individual is born in 1949, 0 if the individual is born in 1946 or 1952.

Replication: This table corresponds to Table 5 in Maurin and McNally (2008).

The IV estimates are 1.5 times larger than the OLS ones. An explanation suggested by Maurin and McNally (2008) is that it might be due to measurement error on the educational variable, which would downwardly bias the OLS estimate. Nevertheless, the literature documenting the extent of measurement error on self-reported educational variables indicates a downward bias of only 10 to 15%[8] (Ashenfelter and Krueger, 1994; Angrist and Krueger, 1999; Card, 2001), which explains – if anything – a small part of the difference between OLS and IV estimates.

They also argue that it is common in the literature on the wage returns to education, referring to Card (2001). However on the one hand Card (1999) reports that "estimated returns to schooling are 20-40% above the corresponding OLS estimates", reviewing studies using institutional changes in the education system as instrument, noticeably below the 50% found here. On the other hand Card (2001) explains that IV estimates are indeed as large or larger than OLS ones, but for instruments affecting the bottom part of the education distribution,[9] which is not the case with the events of May 1968. The instrumentation is here used to correct an omitted variable bias, which leads to expect smaller IV than OLS estimates. Furthermore based on the first stage estimations, we suspected that the instrument might be weak, which could also explain the results found here.

In order to investigate whether estimations based on alternative educational outcomes would less suffer from weak instrument bias, we additionally estimate the impact of the instrument on having at least – either any or a *général* – *baccalauréat*. As mentioned, we expect being born in 1949 to affect more the probability of having at least a *baccalauréat général*. For the first stage, the results and F-statistics are reported in Table 13 in appendix and are similar to the ones corresponding to having at least a university diploma or degree (0.029 and 0.027 for the estimates, 12.34 and

[8]The reliability ratio of the schooling measure, i.e. the fraction of the variance in the self-reported measures of schooling due to true variation in schooling is estimated around 85 to 90%.

[9]Card (2001) suggests that "marginal returns to education among the low-education subgroups typically affected by supply-side innovations tend to be relatively high, reflecting their high marginal costs of schooling, rather than low ability that limits their return to education".

12.02 for the F-statistics). Concerning the second stage, reported in Table 14 in appendix, IV estimates are again about 1.5 times larger than the OLS ones.

4.3 Alternative specifications and placebo tests

In order to ensure the validity of their estimation, Maurin and McNally (2008) investigate various alternative specifications, which results are provided in Table 7. They slightly change the composition of their control group, keeping individuals born in 1949 as the treated group. They only report the IV estimates, and not the first stage coefficients and the F-statistics. We replicate the specifications and provide both first stage and IV results.

Table 7: Instrumental variable effect of years of education: Alternative specifications in Maurin and McNally (2008) and replicated using LFS

Control Groups	1947 and 1951	1945 and 1953	1944-47 and 1950-53	1944-47	1950-53
	(1)	(2)	(3)	(4)	(5)
Maurin & McNally					
IV estimates			**Log wage**		
Years of higher education	0.14 (0.06)	0.16 (0.06)	0.13 (0.06)	0.16 (0.11)	0.18 (0.08)
Observations	11,427	10,292	31,520	16,145	19,262
Baguet & Lecavelier					
IV estimates			**Log wage**		
Years of higher education	0.15 (0.05)	0.27 (0.13)	0.17 (0.07)	0.10 (0.09)	0.12 (0.07)
Observations	11,432	10,294	31,530	16,155	19,272
First stage estimates			**Years of higher education**		
$May68$	0.12 (0.05)	0.09 (0.05)	0.12 (0.04)	0.16 (0.08)	0.17 (0.07)
F-stat	6.52	3.44	7.50	3.79	7.23

Source: LFS 1990, 1993, 1996 and 1999.

Sample: Male wage earners born between 1944 and 1953 depending on specifications.

Specification: $May68$ equals 1 if the individual is born in 1949, 0 for the control groups. Control for age and cohort trend are included in all regressions.

Replication: This table corresponds to Table B1 in Maurin and McNally (2008).

Maurin and McNally (2008) find fairly stable results and argue that it confirms the validity of birth year 1949 as an instrument for education. Concerning sample sizes as well as IV estimates, our results are relatively close. However the F-statistics of our first stage estimations range from 3.44 to 7.50, far from the threshold of 10, indicating a weak instrument. Thus when slightly modifying the control groups, the F-statistic substantially decreases, which discredits the robustness of the instrument.

As an additional verification to check the validity of the natural experiment, we also implement placebo tests for men born between 1939 and 1959, for the number

of years of higher education. We use the same "three years before/three years after" rule as in the main specification (1949 versus 1946 and 1952). For example if 1957 is considered as the treated year, then the control group includes 1954 and 1960 cohorts. The results are displayed in appendix in Figure 8. Even if the main specification is indeed the one providing the F-statistic closest to the threshold for weak instrument, other placebo specifications yield effects of similar magnitude.

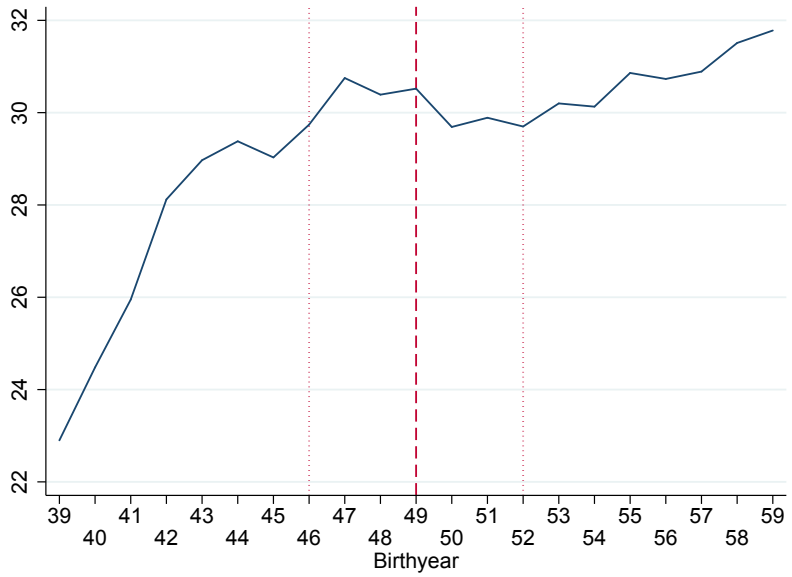
5 Alternative data sets

5.1 Census Data

In the previous section, we revealed that birth year 1949 is a weak instrument for education using LFS, in the attempt to use the events of May 1968 as a natural experiment. Since it could be related to small sample size issues, we compute the same first stage estimations using Census data to verify whether a larger alternative dataset would yield better results. Indeed, as mentioned, we only expect a small proportion of the individuals to be affected by the instrument: only the birth cohort 1949 and among them only high schoolers who obtained the *baccalauréat* thanks to the events. First we display in Figure 4 the proportions of men who have at least a *baccalauréat* by birth year, from 1939 to 1959. There is an increasing trend, however even if the rate of birth year 1949 is higher than the mean of the rates of birth years 1946 and 1952, we do not observe any clear peak for birth year 1949.

To compute the first stage estimate of the effect of birth year 1949 on education, we select as comparison group the symmetrical birth cohorts of 1946 and 1952: the first stage specification used by Maurin and McNally (2008) to compute their IV estimates. Thus, we use the dummy variable $May68$ equal to 1 for individuals born in 1949 and to 0 for those born either in 1946 or 1952. Table 8 provides the first stage coefficients for the three educational outcomes: having only a *baccalauréat*, any university diploma or degree and the number of years of higher education. Maurin

Figure 4: Proportion of individuals passing the *baccalauréat* among men born from 1939 to 1959 using Census



Source: Census 1999.

and McNally (2008) also present these results using Census data[10] in the appendix of their paper and we also report them in Table 8. See Table 13 in appendix for our results on having at least the *baccalauréat* and at least the *baccalauréat général*.

We find similar even if slightly higher results as in Maurin and McNally (2008) for all educational outcomes. The effect of the instrument is negative on the likelihood to have only a *baccalauréat*, not significant in Maurin and McNally (2008) contrary to our result, but negligible in both cases. Being born in 1949 – i.e. being affected by the events of May 1968 – increases the probability of having a university diploma or degree by 0.7 to 0.9 percentage points. For instance, for men born in 1949 this probability is 19.7%, versus 18.8% otherwise. Individuals affected by the instrument have 0.04 to 0.05 additional years of higher education.

Thus we still observe a highly significant, but really small effect of $May68$ on higher education. Compared to the coefficients obtained using LFS, the ones from Census data are 3 times smaller for university diploma or degree and number of years

[10]Maurin and McNally (2008) use a 25% random sample of the 1982 Census, whereas we use the full 1999 Census.

Table 8: First stage estimations: Effect of $May68$ on education outcomes in Maurin and McNally (2008) and replicated using Census

	Maurin & McNally			**Baguet & Lecavelier**		
	Baccalauréat only	University diploma or degree	Years of higher education	*Baccalauréat* only	University diploma or degree	Years of higher education
	(1)	(2)	(3)	(4)	(5)	(6)
$May68$	-0.001	0.007***	0.042***	-0.002***	0.009***	0.054***
	(0.001)	(0.001)	(0.008)	(0.001)	(0.001)	(0.005)
Birth year	0.001***	0.000	-0.001	0.000	-0.000	-0.004
	(0.000)	(0.000)	(0.002)	(0.000)	(0.000)	(0.001)
F-stat	-	-	-	8.20	141.00	110.26
R-squared	-	-	-	0.000	0.000	0.000
Observations	328,916	328,916	328,916	1,056,384	1,056,384	1,056,384

Source: 25% random sample of Census 1982 for (1), (2) and (3), Census 1999 for (4), (5) and (6).
Samples: Men born in 1946, 1949 and 1952.
Specification: $May68$ equals 1 if the individual is born in 1949, 0 if the individual is born in 1946 or1952.
Replication: This table corresponds to Table C1 in Maurin and McNally (2008).
Significance levels : $*$: 10% $**$: 5% $***$: 1%

of higher education when considering wage earners and 2 times when considering all men. As discussed previously, using Census data to compute these first stage estimates allows us to work with very large samples (almost 100 times larger than the LFS ones) which yields much higher F-statistics, largely above the threshold for weak instruments for these two outcomes.

To explain the important gap between the results obtained with the two data sets, Maurin and McNally (2008) argue that the Census is "a lot less reliable than the LFS for measuring individual characteristics (notably education and date of birth)". Another source of divergence could have been that the Census does not contain any information on wages. Thus the estimates are computed on men and not on male workers only. Nonetheless the same estimations on all men with LFS (see Table 4) yield results lower than on wage earners but still higher than the ones obtained from Census data.

As mentioned, the Census dataset does not contain wage information. We considered a TS2SLS strategy, by computing the first stage on Census data and the instrumentation on LFS data. However the Census first stage estimates are even lower than the LFS ones and thus yielded even higher IV estimates than found in

Maurin and McNally (2008).

We compute the same placebo tests as in Section 4.3 on Census data for the number of years of higher education. The results are displayed in appendix in Figure 9. One can see that the results are rather erratic, as we observe 4 specifications with a higher effect than our main specification. Moreover, as opposed to the placebo tests on LFS data, 12 out of the 21 specifications present a F-statistic above 10, which constitutes the conventional limit for weak instrument. Essentially, $May68$ does not stand out as being the only source of variation in education over this time period.

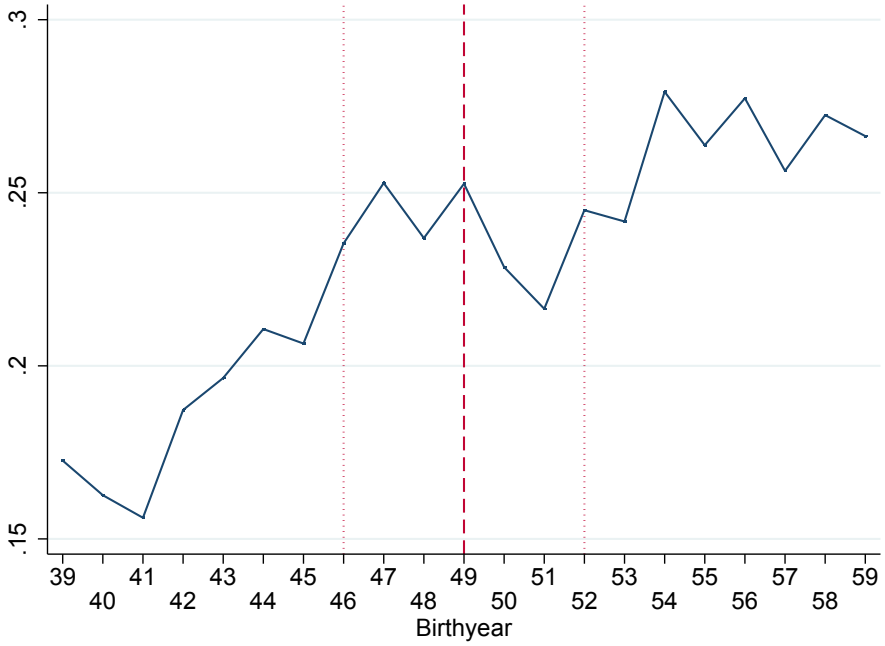
5.2 Education-Training-Employment Survey (FQP)

Results provided in Sections 4 and 5.1 invalidate the use of being born in 1949 as an instrument for education. Nevertheless, the actual instrument is being affected by the events of May 1968, which is more accurately represented by the fact of having taken the *baccalauréat* examination in year 1968, than by being born in 1949. The year individuals have taken their examination is available neither in LFS nor in Census datasets. However, the information is provided in FQP surveys, as a detailed educational calendar is completed for each individual.

For comparison purposes with the other data sources, we display the same representation of the proportion of *bacheliers* by birth cohorts in Figure 5. We observe the same increasing trend and a small peak for the birth year 1949, which however does not stand out, as the curve presents other peaks over the time period.

Again to be able to compare results from FQP surveys with the ones obtained from LFS and Census data, we compute and report in Table 9 the same first stage estimations using being born in 1949 as an instrument. We also want to estimate the effect of the alternative instrument, having taken the *baccalauréat* examination in 1968. We then consider samples of men born between 1946 and 1952. Indeed we cannot exclude birth years close to 1949 as we did so far since a substantial

Figure 5: Proportion of individuals passing the *baccalauréat* among men born from 1939 to 1959 using FQP



Source: FQP 1993 and 2003.

proportion of individuals born these years took the examination in 1968 and should be included in the sample. Thus the instrumental variable based on the year an individual took the *baccalauréat* examination is equal to 1 when the individual took this examination in year 1968, 0 if he/she took this examination any other year.

One downside of using the FQP surveys is the sample size. Our FQP sample using birth year 1949 as an instrument consisting of 2,015 men is 5 times smaller than the LFS sample and 500 times smaller than the Census sample. The effect on having only a *baccalauréat* is still negative. The estimates for having a university diploma or degree and number of years of higher education are similar in magnitude to the ones obtained with the LFS data. Additionally, we compute the same placebo tests as for LFS and Census on FQP data for the number of years of higher education. The results are displayed in appendix in Figure 10.

The sample used to assess the impact of the year of examination consists of 1,130 men born between 1946 and 1952 who took the *baccalauréat* examination at some

Table 9: First stage estimations: Effect of $May68$ on education outcomes using FQP, with either birth year or year of examination as an instrumental variable

	Birth year 1949			**Year of examination 1968**		
	Baccalauréat only	University diploma or degree	Years of higher education	*Baccalauréat* only	University diploma or degree	Years of higher education
	(1)	(2)	(3)	(4)	(5)	(6)
$May68$	-0.023	0.026	0.114	0.003	0.010	0.006
	(0.015)	(0.017)	(0.110)	(0.036)	(0.038)	(0.179)
Birth year	0.001	-0.002	-0.006	0.000	-0.015**	-0.092***
	(0.003)	(0.003)	(0.021)	(0.007)	(0.007)	(0.034)
F-stat	2.40	2.34	1.08	0.01	0.06	0.00
R-squared	0.001	0.001	0.001	0.000	0.004	0.006
Observations	2,015	2,015	2,015	1,130	1,130	1,130

Source: FQP 1993 and 2003.

Sample: For (1), (2) and (3), men born in 1946, 1949 and 1952; for (4), (5) and (6), men born between 1946 and 1952 who took the *baccalauréat* examination.

Specification: For (1), (2) and (3), $May68$ equals 1 if the individual is born in 1949, 0 if the individual is born in 1946 or 1952; for (4), (5) and (6), $May68$ equals 1 if the individual took the *baccalauréat* examination in 1968.

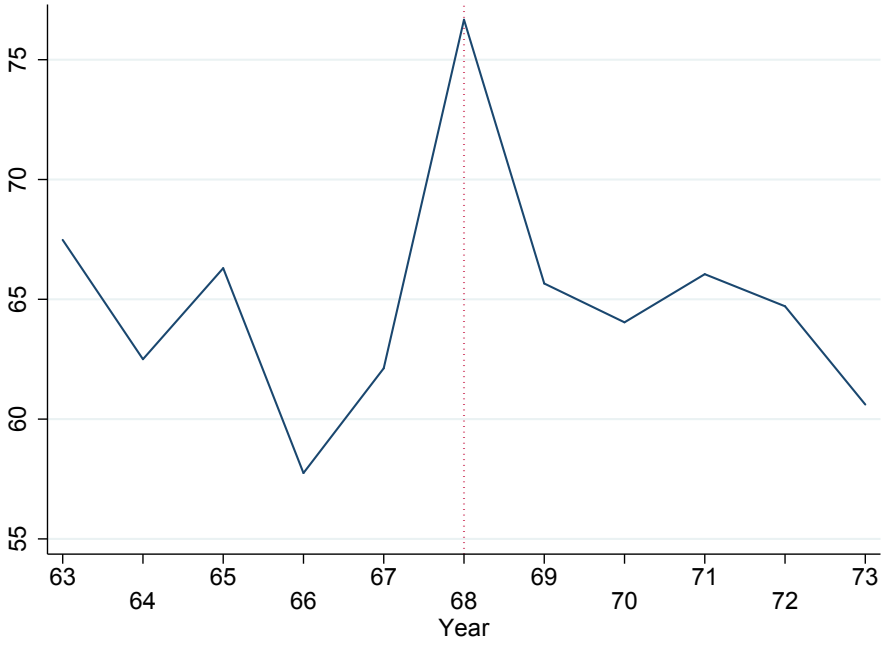
Significance levels : $*$: 10% $**$: 5% $***$: 1%

point. The estimates are negligible, whichever educational outcome considered. Overall none of our estimates obtained from FQP data are significant and all F-statistics are close to 0 (2.40 at most). Thus neither using birth year 1949 nor year of examination 1968 qualifies as a suited instrument.

We report in Table 15 in appendix the corresponding estimates on having at least a *baccalauréat* (*général* or not). Indeed the events of May 1968 mainly led to a modification of the *baccalauréat* examination conditions and thus changed the probability of obtaining the *baccalauréat* and potentially pursuing higher education studies. The estimates are again small and not statistically significant, and the instrument is weak.

Overall, whichever educational outcome, the estimates are consistently insignificant. One possible explanation is that students can take the *baccalauréat* examination more than once. Indeed if they fail the first time, they have the opportunity to repeat the last grade of high school and take the examination again, until they succeed. Obtaining the *baccalauréat* at first or second try only changes the year of success, but not the fact of having it or not in the end.

Figure 6: Success rates at the *baccalauréat* among men for sessions 1963 to 1973 using FQP



Source: FQP 1993 and 2003.

In Figure 1, we observed an increase in the rate of success at the *baccalauréat* examination by nearly 20 percentage points in 1968 compared to the adjacent years. We find similar rates of success by examination year using FQP data, as seen in Figure 6. However it does not correspond to the probability to ever have a *baccalauréat* when considering the possibility to take it more than once. Indeed Table 10 displays the success rates by year of first try at the examination, depending on whether the students took the *baccalauréat* examination for the first time, or considering the possibility to fail, repeat the last grade of high school and take it again. The rate of success indeed increased for the year 1968 for students taking the examination for the first. Nevertheless, the probability of ever obtaining the *baccalauréat* remains fairly stable over the considered period (with a slight decreasing trend at the end) and is only slightly higher in year 1968. These results should be considered with caution due to small sample size.

Thus the events of May 1968 increased the likelihood to obtain the *baccalauréat*

Table 10: Success rates by year of first try at the examination, for the first try or with the possibility to take it more than once

	1965	1966	1967	1968	1969	1970	1971
First try	64.67	53.59	58.44	75.45	67.60	63.12	63.64
Ever	90.00	90.85	87.66	91.02	88.27	86.52	83.42
Number of candidates	150	153	154	167	179	141	187

Source: FQP 1993 and 2003.
Sample: Men who took the *baccalauréat* examination between 1965 and 1971.
Specification: The first row corresponds to the probability of obtaining the *baccalauréat* in year t if the student took the examination for the first time in year t. The second row corresponds to the probability of ever obtaining the *baccalauréat* (in year t or later) if the student took the examination for the first time in year t.

in year 1968 by about 30%, but not significantly the likelihood of ever obtaining it (which is fairly stable around 88% on average when taking it once or more). It only created an anticipation effect. A large part of individuals who benefited from the higher rate of success of 1968 would otherwise have obtained the *baccalauréat* in 1969 anyway, by repeating the last year of high school and taking the examination again. All in all the events of May 1968 did not significantly change the education level of the population affected and thus cannot be used to instrument it.

6 Conclusion

In this paper we investigate whether the events of May 1968 can be used as a natural experiment to instrument education. Indeed Maurin and McNally (2008) justify the use of these events by arguing that the unusually high rate of success at the *baccalauréat* in year 1968 was unique, unexpected and temporary. However not only the change in the modalities of examination led to an increase in the rate of *bacheliers*, but the *baccalauréat technologique* was also created in 1968 with a first session in 1969. Thus the opportunities offered by the education system were modified for students coming after May 1968 events.

Furthermore Maurin and McNally (2008) use birth year 1949 as an instrument.

The authors do not dispose of the year individuals took their examinations and argue that individuals born in 1949 are the most likely to have taken the *baccalauréat* examination in year 1968. Nonetheless even if the median age to take the examination was indeed 19, a substantial part of students who took the examination in 1968 were likely born before or after 1949 (in particular in 1950 for students who never repeated any grade and took the examination at age 18).

To assess the validity of the natural experiment, we replicate the estimations of Maurin and McNally (2008). Using the same LFS data and strategy, we are able to accurately reproduce their results. However further investigating the first stage estimations and in particular the F-statistics, we find that not only the effect is very small but the instrument is weak. This can explain why Maurin and McNally (2008) find IV estimates much larger than their OLS ones. This replication exercise raises concerns about the validity of using being born in 1949 as an instrumental variable.

Indeed we suspect weak instrument issues as the instrument might be positively correlated with other determinants of the outcome of interest (here earnings or children's education), which would violate the exclusion restriction. One possible explanation would be that the modifications in social and moral norms caused by the events of May 1968 might have induced changes in preferences on the treated population. It would be the case if being born in 1949 and thus be treated by the events of May 1968 was correlated for example with the likelihood of being unionized, the relationship to hierarchy and/or the taste for independence (traits potentially related to labor market outcomes).

In order to dismiss the possibility that the weak instrument concern is due to small sample size, and investigate whether a larger data set would be more suitable, we compute the same estimations on Census data. The F-statistics become largely above the threshold for weak instrument. However the estimates are even smaller than those obtained from LFS data. Moreover the instrument fails at the placebo tests, as artificial alternative birth cohorts yield higher effect and F-statistics. Over-

all whichever the data source exploited, being born in 1949 reveals to be an unsatisfying instrument.

Thus we excluded birth year 1949, but not that an alternative instrument can be used to represent the fact of being affected by the events of May 1968. In particular the year individuals took the *baccalauréat* examination seems to be the most relevant one. We compute the first stage estimations using FQP data, as an educational calendar is provided in these surveys. We find negligible estimates associated with F-statistics hardly different from 0 and conclude that taking the *baccalauréat* examination in 1968 did not increase the likelihood to obtain the *baccalauréat* and potentially pursue higher education studies.

Since students have the opportunity to take the examination more than once, the events only created an anticipation effect. Finally, beyond any data source, sampling and estimation strategies or choice of educational outcome issues, the events of May 1968 increased the rate of success at the *baccalauréat* examination for year 1968 but had no impact on the final level of education. Thus these events cannot be used as a natural experiment.

A Appendix

Figure 7: Figure 1 in Maurin and McNally (2008)

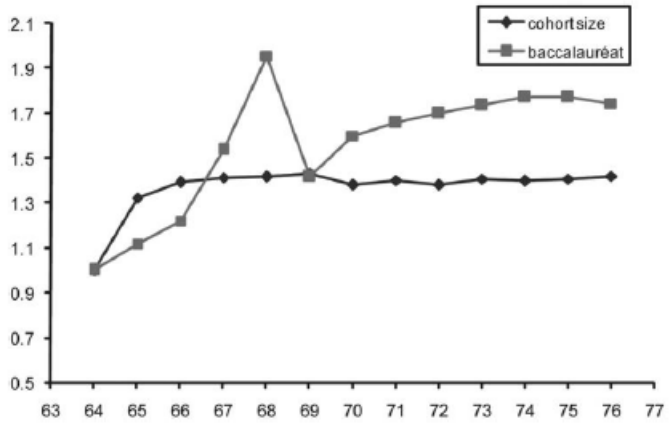


FIG. 1.—Trends in the number of *bacheliers* and in cohort size. The size of the cohort for year t corresponds to the number of persons born at $t - 19$ (19 is the median age of candidates). The two series are normalized to one in 1945. Source: French Ministry of Education (number of *bacheliers*) and the French Statistical Office (cohort size).

Source: Maurin and McNally (2008).

Table 11: *Baccalauréat* examination from 1945 to 1953 (men and women)

			Baccalauréat			***Baccalauréat général***		
Birth year	Cohort size	Year of examination	Taking the examination	Passing the examination	Success rate	Taking the examination	Passing the examination	Success rate
1945	645,899	1964	138,430	86,729	62.7	138,430	86,729	62.7
1946	843,904	1965	159,186	96,924	60.9	159,186	96,924	60.9
1947	870,472	1966	212,420	105,839	49.8	212,420	105,839	49.8
1948	870,836	1967	223,410	133,257	59.6	223,410	133,257	59.6
1949	872,661	1968	208,460	169,422	81.3	208,460	169,422	81.3
1950	862,310	1969	207,682	137,015	66.0	181,466	122,673	67.6
1951	826,722	1970	249,120	167,307	67.2	200,722	138,707	69.1
1952	822,204	1971	272,009	176,766	65.0	217,298	143,729	66.1
1953	804,696	1972	282,263	184,196	65.3	221,453	147,352	66.5

Source: French Statistical Office INSEE (cohort size) and French Ministry of Education (examinations data).
Following Maurin and McNally (2008), the birth year t corresponds to the year of examination $t + 19$
(19 is the median age for the candidates).

Table 12: Additional descriptive statistics using LFS, Census and FQP

	LFS				**Census**		**FQP**	
	Male wage earners		All men		All men		All men	
	Mean	(Std. Dev.)	Mean	(Std. Dev.)	Mean	(Std. Dev.)	Mean	(Std. Dev.)
Education outcomes								
Baccalauréat at least	0.278	(0.445)	0.272	(0.442)	0.301	(0.459)	0.238	(0.426)
Baccalauréat général at least	0.263	(0.443)	0.220	(0.414)	0.232	(0.422)	0.197	(0.397)
Observations	26,293		36,629		2,488,383		4,828	

Source: LFS 1990, 1993, 1996 and 1999, Census 1999 and FQP 1993 and 2003.
Sample: Men born between 1946 and 1952.

As reported in Table 12, 27.8% of the LFS sample of male wage earners have at least a *baccalauréat* and 26.3% have at least a *baccalauréat général*. The corresponding proportions for all men are 27.2% and 22.0% in the LFS sample, 30.1% and 23.2% in the Census sample, and 23.8% and 19.7% in the FQP sample.

Table 13: First stage estimations: Effect of $May68$ on alternative education outcomes using LFS and Census

	LFS				**Census**	
	Male wage earners		All men		All men	
	Baccalauréat at least	*Baccalauréat général* at least	*Baccalauréat* at least	*Baccalauréat général* at least	*Baccalauréat* at least	*Baccalauréat général* at least
	(1)	(2)	(3)	(4)	(5)	(6)
$May68$	0.029***	0.029***	0.021***	0.017**	0.008***	0.008***
	(0.001)	(0.000)	(0.007)	(0.007)	(0.001)	(0.001)
Birth year	0.007***	0.004**	0.006***	0.004**	0.000	0.000
	(0.002)	(0.002)	(0.002)	(0.002)	(0.000)	(0.000)
F-stat	10.79	12.02	7.59	6.09	65.64	85.34
R-squared	0.001	0.002	0.001	0.001	0.000	0.000
Observations	11,145	11,145	15,433	15,433	1,056,384	1,056,384

Source: LFS 1990, 1993, 1996 and 1999, and Census 1999.

Sample: Male wage earners/men born in 1946, 1949 and 1952.

Specification: $May68$ equals 1 if the individual is born in 1949, 0 if the individual is born in 1946 or 1952.

Significance levels : $*$: 10% $**$: 5% $***$: 1%

Table 13 shows that being born in 1949 (versus 1946 or 1952) increases the likelihood of having at least a *baccalauréat* (of any kind or *général*) by about 3 percentage points for the LFS sample – when considering wage earners – which corresponds to a probability of around 31% instead of 28% for all kinds of *baccalauréats* and around 29% instead of 26% for the *baccalauréat général*. When considering all men from LFS data, the increase is about 2%, leading to a probability of 29% instead of 27% for all kinds of *baccalauréats* and around 24% instead of 22% for the *baccalauréat général*. Corresponding rates for the Census sample are 31% instead of 30% and 24% instead of 23% respectively, as the increase is only of 0.8 percentage points. The results obtained from LFS data are about 2 to 3 times larger than the ones obtained from Census data.

Table 14: Evaluation of the returns to education using alternative education outcomes on LFS

	Log wage			
	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)
Baccalauréat général at least	0.511***	0.755**		
	(0.010)	(0.318)		
Baccalauréat at least			0.503***	0.746**
			(0.009)	(0.311)
Birth year	0.010***	0.010***	0.009***	0.008***
	(0.002)	(0.003)	(0.002)	(0.003)
R-squared	0.21		0.23	
Observations	11,145	11,145	11,145	11,145

Source: LFS 1990, 1993, 1996 and 1999.

Sample: Male wage earners born in 1946, 1949 and 1952.

Specification: $May68$ equals 1 if the individual is born in 1949, 0 if the individual is born in 1946 or 1952.

Table 15: First stage estimations: Effect of $May68$ on alternative education outcomes using FQP, with either birth year or year of examination as an instrumental variable

	Birth year 1949		Year of examination	
	Baccalauréat at least	*Baccalauréat général* at least	*Baccalauréat* at least	*Baccalauréat général* at least
	(1)	(2)	(3)	(4)
$May68$	0.012	0.014	0.022	0.037
	(0.020)	(0.019)	(0.025)	(0.031)
Birth year	0.002	-0.003	-0.010**	-0.027***
	(0.004)	(0.004)	(0.005)	(0.006)
F-stat	0.37	0.57	0.74	1.39
R-squared	0.000	0.001	0.005	0.019
Observations	2,015	2,015	1,130	1,130

Source: FQP 1993 and 2003.

Sample: For (1) and (2), individuals born in 1946, 1949 and 1952; for (3) and (4), individuals born between 1946 and 1952 who took the *baccalauréat* examination.

Specification: For (1) and (2), $May68$ equals 1 if the individual is born in 1949, 0 if the individual is born in 1946 or1952; for (3) and (4), $May68$ equals 1 if the individual took the *baccalauréat* examination in 1968.

Significance levels : $*$: 10% $**$: 5% $***$: 1%

Figure 8: Robustness checks for men born from 1939 to 1959, using LFS data, outcome: Years of higher education

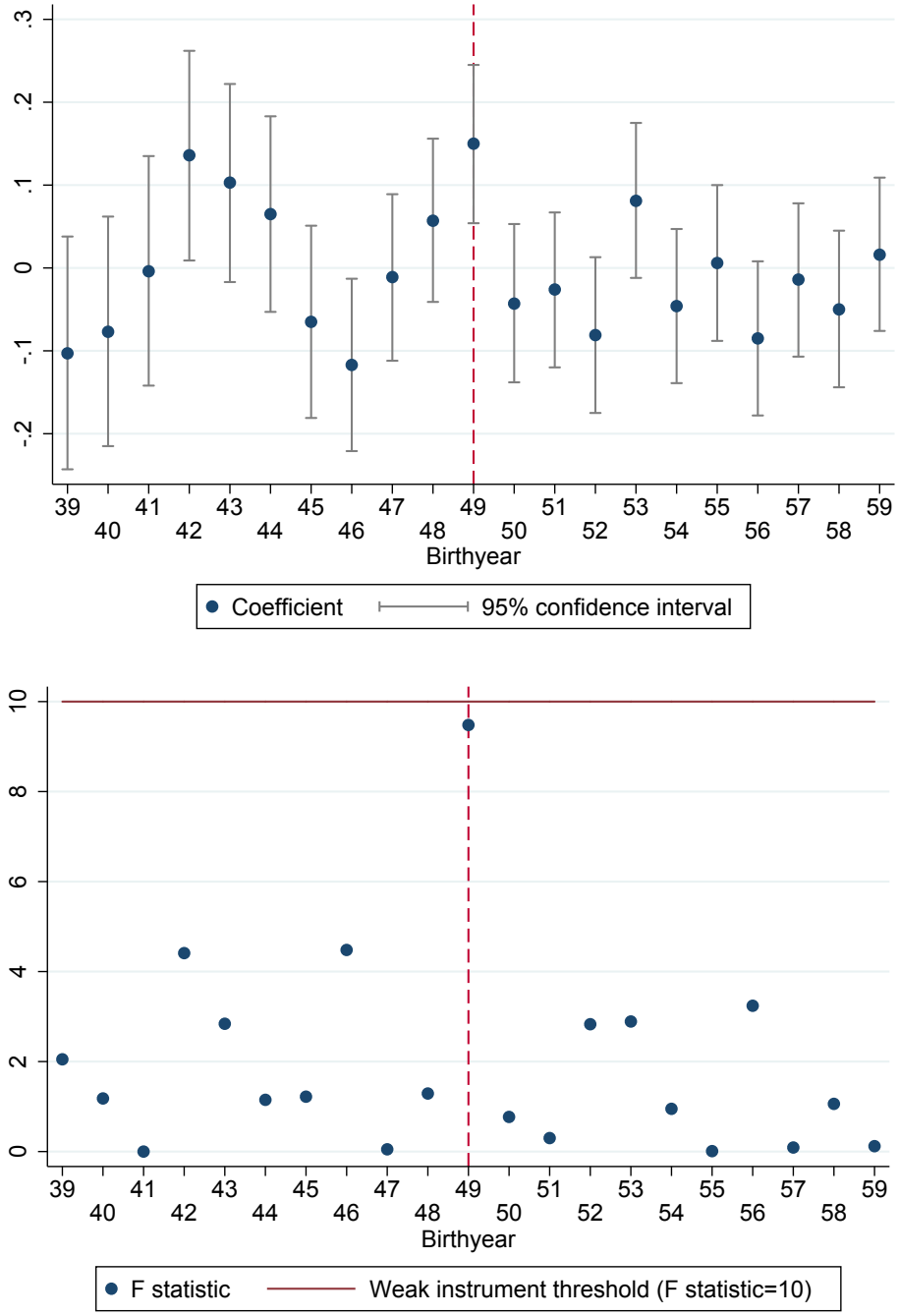
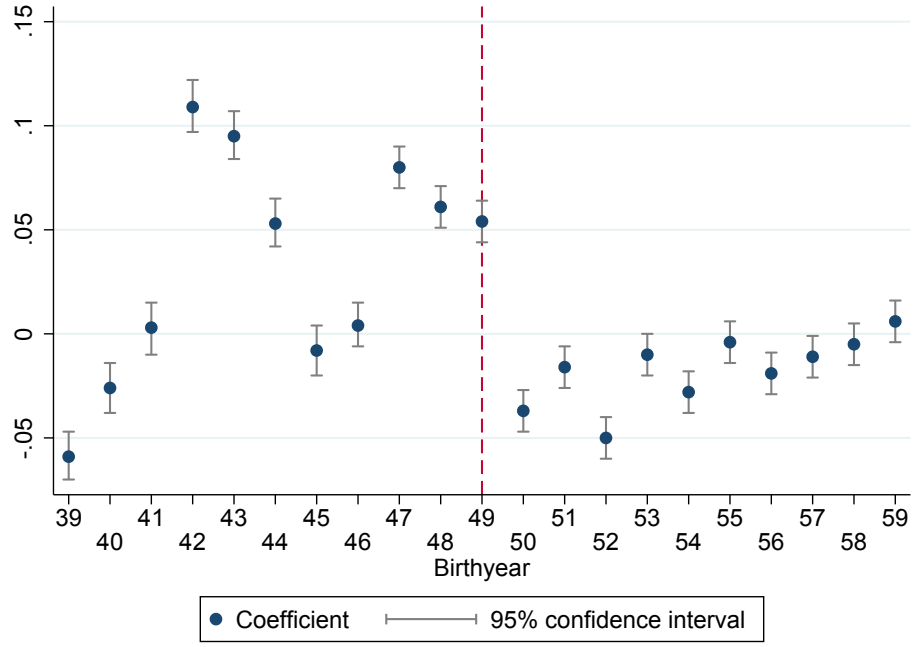


Figure 9: Robustness checks for men born from 1939 to 1959, using Census data, outcome: Years of higher education



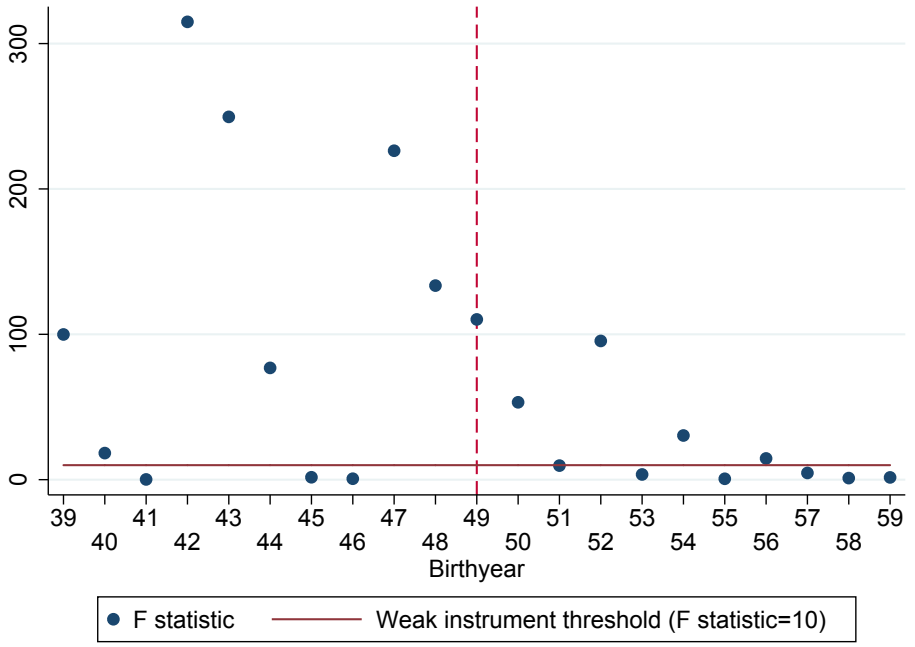
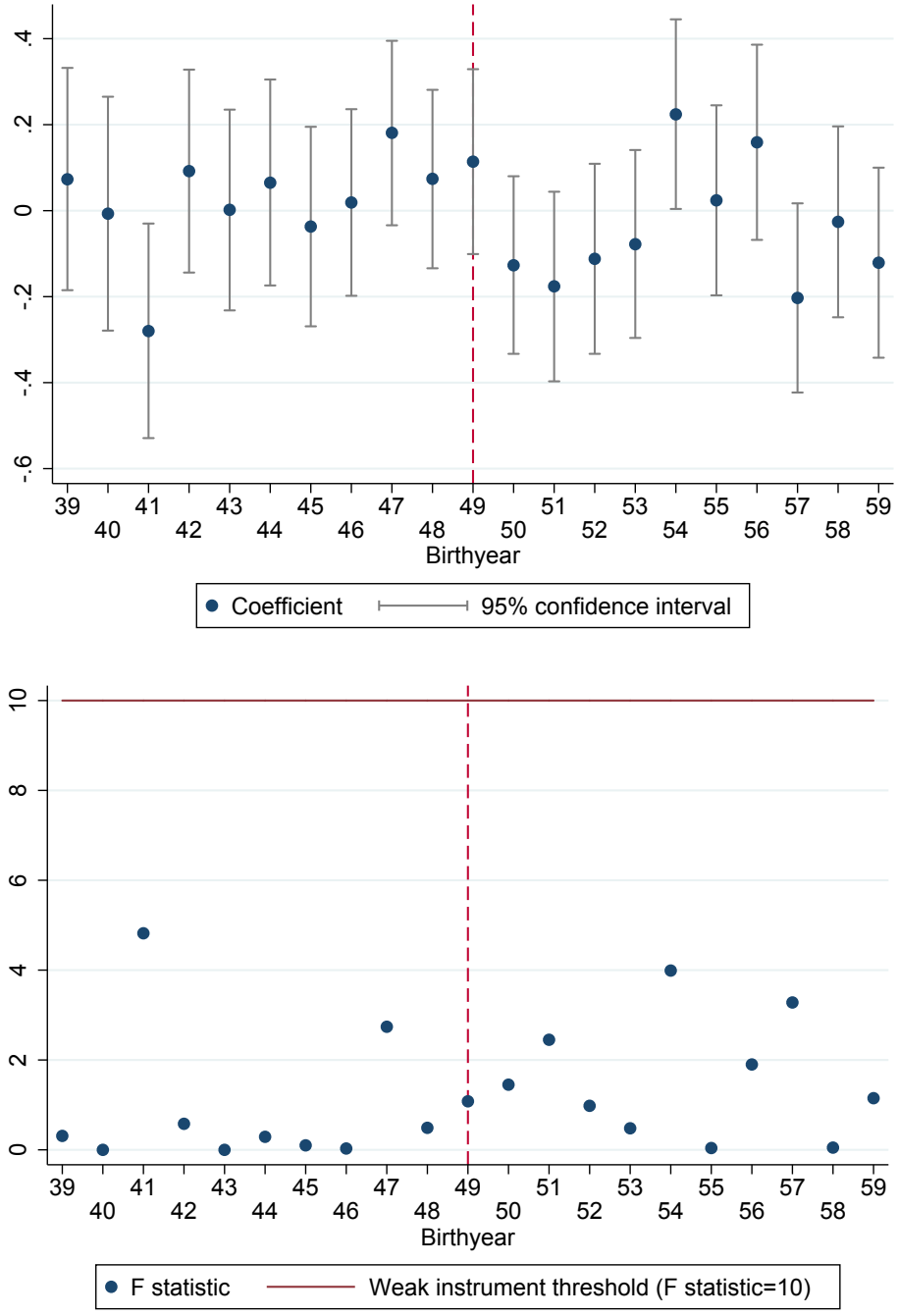


Figure 10: Robustness checks for men born from 1939 to 1959, using FQP data, outcome: Years of higher education



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