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IZA DP No. 9046

Nature or Nurture in Higher Education? Inter-generational Implications of the Vietnam-Era Lottery

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May 2015

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ABSTRACT

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It is evident that a strong positive correlation persists between the educational attainment of parents and that of their children in many, if not most, populations. This relationship may form an important part of the phenomenon of low social mobility as well as inefficiently low investment in human capital by youth who have parents with relatively low educational attainment. Is it a genetic inter-generational transmission of innate ability from parents to their children (i.e. nature) or is it the environment that the better educated parents provide for their children (i.e. nurture) that explains this positive relationship? Understanding the relative contributions of nature versus nurture is critical to the development of any social policy designed to increase social and economic mobility between generations. Separating the so-called nature and nurture effects of this relationship is a difficult task. We use the Vietnam Era Draft Lottery as a natural experiment to address the nature-nurture question. Attending university in order to avoid the draft created a cohort which included individuals who would not normally have attended post-secondary educational institutions. Comparing the educational attainment of children of this cohort to that of cohorts who attended university in "normal times" creates a natural experiment to test the relative importance of the nature or nurture explanations. Our findings provide evidence in support of the nurture argument.

NON-TECHNICAL SUMMARY

Earlier studies show that the Vietnam draft lottery provided extra incentives for men to attend university and that their attendance increased. Men who (for nature reasons) might not have gone to university during "normal times" appear to have gone to university to avoid the draft. We examine the propensity of their children to go to university relative to those of a control group. Did those children behave as nature would suggest, or did the nurture provided by their university-educated fathers lead them to be as at least as likely to go to university? Consistent with nurture, we find the latter.

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1 Introduction

There is longstanding concern that low inter-generational mobility creates economic and social problems that are linked to high levels of economic inequality and economic inefficiency, although the direction of causality is not so clear. As reported by Corak (2013), the OECD (2011, p.40) has expressed the view that rising economic inequality "can stifle upward mobility, making it harder for talented and hard-working people to get the rewards they deserve." Besides a concern with justice and economic welfare, low social mobility can blunt incentives and so lead to lower overall productivity. Several studies have investigated the role that the inter-generational transmission of education attainment plays in this phenomenon. It is with this part of the literature that we are primarily concerned in this paper.

Hertz et al. (2007) estimate 50-year trends in the inter-generational persistence of educational attainment for 42 countries and find an overall average correlation between the schooling of the parents and that of their offspring of approximately 0.4. They also find substantial regional variations which suggest that policy interventions may be able to modify this relationship. Since the level of education is an important determinant of earnings and overall well-being, understanding the reason for this positive correlation is important. As Black et al. (2009) point out, the reason may be "a pure selection story: the type of parent who has more education and earns a higher salary has the type of child who will do so as well, regardless. Another story is one of causation: obtaining more education makes one a different type of parent, and thus leads to the children having higher educational outcomes." If the latter is correct, then policies which increase education in one generation will have spillover effects for the next generation. To distinguish between selection and causation, however, is challenging and the best opportunities for doing so have been natural experiments in which a shock occurs that changes the incentive to obtain education. In the case of Black et al. (2009), the shock explored is a change in compulsory schooling laws in Norway during the 1960s which increased the minimum required years of schooling from seven to nine. We use the Vietnam Era Draft Lottery as a natural experiment to address causation in the context of the nature-nurture question and to identify whether there is a causal effect of parental education on children's education. Card and Lemieux (2001) showed that the college enrolment rates for men increased and fell abruptly between 1965 and 1975. Therefore, the strategy of

attending university in order to avoid the draft creates a cohort of men who would not normally have attended post-secondary education (PSE) institutions. We will refer to this cohort as the "PSE draft avoiders cohort." Comparing the educational attainment of the children of this cohort to that of cohorts who attended university in "normal times" creates a natural experiment to test the relative importance of the nature and nurture explanations. If the transmission of post-secondary education from parents to children for the "normal cohorts" exceeds that for the "PSE draft avoiders cohort", then we conclude that individuals who would not normally have obtained PSE do not pass on that achievement to as great an extent as "normal" PSE attendees. Such a result would be consistent with at least some extent of nature being the reason for the inter-generational transmission of PSE. This follows since such a finding would imply that those who would not normally have attended PSE would, under the nature explanation, have lower innate ability and so pass on lower innate ability to their children which would in turn reduce the chances of them attending PSE. However, a finding that there is the same degree of inter-generational transmission of PSE for the two cohorts points in the direction of a nurture explanation. This follows since such a finding would imply that those who would not normally have attended PSE but do so for ulterior motives pass on to their children the ability and aspiration for PSE to the same extent of "normal PSE attendees." Such a result, which is what we find, is consistent with the nurture explanation; that is, the act of attaining some PSE in itself appears to create a different sort of parent and a different sort of environment for the children and this leads these children to also be more likely to obtain some PSE. In other words, it appears that the education level of one generation has a causal effect on the education level of the subsequent generation.

Both the nature and nurture explanations for the inter-generational transmission of education are admittedly highly nuanced. In particular, the nurture explanation may reflect many factors responsible for the observation that a child with highly educated parents is more likely to obtain a relatively high level of education. That is, regardless of the reason for obtaining a high level of education, doing so may lead parents to make decisions or take on behavioural traits that lead to higher educational achievement by their children. One channel may simply be increased parental expectations for children's educational attainment. Parents who have chosen to attend university may serve as positive role models for their children's educational

aspirations (see Christofides et al., forthcoming) regardless of any purposive behaviour by the parents. It is also well-established that parents with higher education are more likely to live in "good neighbourhoods" and spend more money on items that promote cognitive development (e.g., books, computers, tutors, etc.).[1] We do not disentangle which of these channels are more or less important. However, our analysis does provide a test for whether inter-generational transmission of education is based on nurture or nature. Our results are consistent with nurture being the more plausible explanation for the inter-generational transmission of higher education.

We also identify the cohort of men which includes those who either voluntarily or through conscription participated in the Vietnam War and which was thus later faced with an extra incentive to attend university due to grants provided through the GI Bill. This latter group may also represent a cohort that includes men who would not under normal circumstances have attended college or university. However, these two groups of men were influenced by the occurrence of the war in very different ways and so probably possess quite different characteristics. To illustrate this distinction and also to explain our identification strategy more clearly, consider the following, admittedly simplistic, explanation which provides some intuition about the methodology that we invoke.
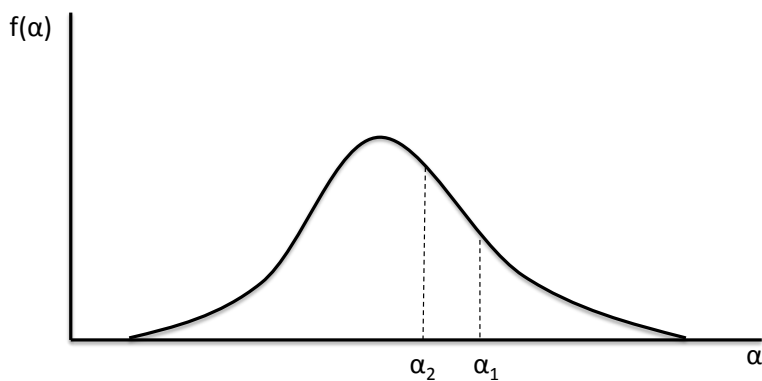
Figure 1: Distribution of characteristic index for PSE tendency

Suppose there is some index of characteristics, α, which represents the inclination to attend PSE. Let $f(\alpha)$ represent the density for α and assume that there is some cut-off value

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[1]For reference to work that supports the channel of aspirations and expectations see Christofides et al. (forthcoming). Corak (2013) provides information on the latter (nurture) effect (see especially Figure 6, p. 91 of Corak (2013)).

of α which demarcates those who will attend university and those who will not. For example, if the normal cut-off value is α_1 in Figure 1, then all those with $\alpha \geq \alpha_1$ will attend university while those with $\alpha < \alpha_1$ will not. Just what this characteristic represents depends on what beliefs or what model one has in mind to explain PSE attendance, as we explain further below. However, whatever characteristics index α measures and so whatever is presumed to determine PSE attendance decisions, men who we call draft avoiders are those who have $\alpha < \alpha_1$ but place an additional value on attending university in order to avoid the risk of being drafted. Although the strength of preference of draft avoiders to avoid the draft may be correlated with α, it seems likely that some such individuals who attend university to avoid the draft will come from the group with $\alpha < \alpha_1$. In fact, this seems clearly the case given the results of Card and Lemieux (2001) that show more men than usual did attend PSE during the years of risk of conscription.

Now, suppose the reason that there is a positive correlation between the education level of children and parents is entirely due to nature; that is, parents with a sufficiently high level of the characteristic (index) α to have obtained some post-secondary education will have children who also tend to have a higher level of α than their cohorts and so these children are also more likely to attend PSE. For the nature explanation, α is usually considered to be some heritable trait (or set of traits) representing innate ability. This is one explanation for the observation that children with parents who have post-secondary education are more likely to also attend PSE. The cohort of men that includes draft avoiders will include men with a lower level of α than the cut-off value α_1. Therefore, their children will on average have a relatively lower level of α than would the children of parents with PSE coming from "normal cohorts." Under a nature explanation of inter-generational transmission of education, the impact of parental education on children's education should be less for the cohort that includes the draft avoiders. We find little to no evidence of this being the case. In other words, it appears that it is simply the fact that an individual has attended PSE that creates a higher likelihood that the person's child will attend PSE and this is not driven by inheritance of some genetic ability (i.e., in the words of Black et al. (2009), we find that attending PSE "makes one a different type of parent"). Our empirical results suggest that a nurture explanation for the inter-generational transmission of education is more plausible. What drives the nurture

explanation may reflect a wide variety of environmental reasons and our analysis does not allow for disentangling these. Obtaining some PSE may affect many personal characteristics and behaviours of parents that influence their children's decisions about PSE attendance, such as parental expectations for their children's educational attainment, parental role model effects, parental inputs related to childhood enrichment, parents' decision on school choice for their children, etc. A variety of these parental characteristics may all contribute to the positive effect of parental education on the level of the children's PSE decision. Our results suggest that whatever are the specific channels, individuals who attend PSE pass on to their children some of the necessary requirements for scholastic achievement and aspirations to gain entry to PSE. Whatever the relative importance of the various channels associated with a nurture explanation, the draft avoiders who would not have attended PSE in normal circumstances appear to transmit their own educational achievements to the same degree as for "normal" cohorts. This is not consistent with the nature explanation provided above.

Our presumption about draft avoiders is that, although those with a higher value of the characteristic (index value) α are more likely to choose PSE attendance as a strategy to avoid the draft, there will be a variety of values of α (all being less than α_1) in that group. Of course, some men with $\alpha > \alpha_1$ may also wish to avoid the draft but would have obtained some PSE in any case and so do not need to be separately treated.

As a result of the Vietnam War, and other wars, there is a second group of "treated" individuals. These are men that would normally have obtained some PSE but chose instead to join the armed forces to serve in the war for one reason or another (e.g., due to feelings of patriotism or to gain a particular type of life experience or possibly a trade). After their service, many such individuals had the opportunity to attend a PSE institution at a reduced cost due to the GI Bill. Moreover, the subsidy would presumably reduce the critical value of the cut-off PSE tendency characteristic α that demarcates those who would decide the net value of PSE is worthwhile. Suppose the critical value for such individuals becomes $\alpha_2 < \alpha_1$ as shown in Figure 1. This being the case, one would expect a group of subsidized individuals possessing α between the values α_1 and α_2 would attend PSE and also create a cohort of individuals who, under the nature explanation, would be less likely to pass on their educational attainment to their children. However, as noted above, this cohort may

also contain individuals with $\alpha > \alpha_1$ and so the prediction on inter-generational attainment is not unambiguous. Moreover, these individuals may be quite different from individuals who would normally obtain some PSE in regards to various other unobserved characteristics as well as their life experiences being very different at time of entry to PSE.

While there have been numerous papers investigating the outcomes of the individuals affected by the Vietnam War lottery, to the best of our knowledge our paper is the first attempt at investigating the outcomes of their children. This paper also stands alone among the inter-generational mobility studies for the novel way in which it exploits an exogenous source of variation in the fathers' incentives to attain tertiary education. We emphasize that our research does not address the general argument of nature versus nurture but only the extent to which it is relevant to the inter-generational transmission of education at the post-secondary level. Many papers have found evidence favouring the nurture debate in that environmental features where the child was reared matter in their life prospects, whereas other papers find that nature and nurture complement each other in this respect (Björklund et al., 2007, 2006). Björklund et al. (2007) study the inter-generational transmission of the socio-economic status that they measure by years of education and income. They investigate a very unique Swedish data set that links children to their biological and adoptive parents and contains information on both. They find that both nature and nurture play roles in the inter-generational transmission of education, albeit with the nature effect significantly larger in magnitude. Using a sample of natural offsprings and adopted children, Plug and Vijverberg (2003) find evidence that 50% of the inter-generational transmission of IQ scores is related to nature rather than nurture. With the exception of a possible link between mothers and sons, Black et al. (2009) find no causal effects of increased compulsory schooling of parents on the education of their children. However, they look at enforced additional schooling at the bottom tail of the distribution (i.e., increasing the mandatory education level from seven to nine years in Norway during the 1960s). Comparing their results to ours suggests that the stage of life at which an exogenous increase in education (for future parents) occurs may have differing causal (nurture) effects on the education level of their children.

In the following section we present the empirical framework. In section 3 we describe the data and the empirical results follow in section 4. The final section concludes.

2 Empirical Framework

We analyze the inter-generational effect of higher education on the children's likelihood of attending PSE in the following framework.

$$P(Y_i = 1) = \quad \gamma_1 I(\text{Father Edu}_i) + \gamma_2 I(\text{Father PA}_i)$$

$$+ \gamma_3 I(\text{Father Edu}_i)^* I(\text{Father PA}_i) + X_i \beta + \epsilon_i \qquad (1)$$

where I(.) is an indicator function and $I(\text{Father Edu}_i)$ is a set of PSE level dummy indicators. $I(\text{Father PA}_i)$ is an indicator of whether the father is born during the Draft Lottery risk years of the Vietnam Era and is considered a Potential Avoider (PA) of the Vietnam-era draft. Since the data does not provide information on whether the father was granted an educational deferment, we proxy the PA status in three different ways. Starting with a general definition, we first use an indicator variable identifying those fathers whose birth year is between 1945–1950. Even though the deferment allowance was fading out for the later birth years after 1950, individuals born in the three years 1951-1953 still faced a risk of conscription, albeit one that was falling. Therefore, we also use three extended definitions of PA status that define the draft avoiders cohorts to be those fathers who were born between 1945–1951, 1945–1952 and 1945–1953. These are explored separately. In order to better approximate the PA status, we define a second definition of the PA status as an indicator variable that identifies fathers who were born in the draft lottery risk years, but who did not serve in the Vietnam War. Finally, the third proxy that we use for the PA status exploits the regulations of the educational deferment policy that issued educational deferments for the post-secondary programs except first professional degrees, and post-graduate degrees such as Master's and doctoral degrees. To construct this third proxy for PA status, we interact the second proxy with a dummy variable that indicates whether the father has an education level which did not qualify for deferment. This last definition approximates best the PA status of the father. ϵ_i is an idiosyncratic error term, $X_i = [\mathbf{1}, Z_i]$ and Z_i is a vector of covariates.

In order to make sure that the PA indicators are not capturing a parental age effect, we add the fathers' and mothers' age and its square as a covariate in the regressions. This is

intended to capture the fact that the incentives that parents transmit to their children could depend on age. Attendance in tertiary education has been increasing for the younger cohorts. We circumvent this potentially confounding effect of the upward trend by adding children's birth year dummy variables. We also account for assortative matching as another unintended implication of the Vietnam War lottery draft. Since the fathers in our sample attended PSE in order to avoid the draft, they may well have met their future wives at school. To capture this channel we include mothers' education as a covariate and its interaction with fathers' education for the survey years (post 1992) that allow a detailed classification of the PSE levels.

Overall, Z_i contains the following characteristics for each individual i: female dummy, race dummies (White, Black, Hispanic), single marital status, dummy variables indicating the number of own children and the number of siblings in the household, adoptive parents indicator, own age and its square, metropolitan city centre and metropolitan out of city centre residence dummies, house ownership dummy, income per capita and its square, father and mother education dummies and their interactions, father and mother age and their square, children's birth year dummies and survey year dummy variables.

3 Data

We have available for use the U.S. Current Population Survey (King et al., 2010) for the years 1981–2014 that is conducted in March of each year. We use the March surveys because they contain both the educational variables and information on veteran status. One limitation of the CPS in the context of this paper, is that it is a household survey. This means that once the young adults leave the household it is impossible to link them to their parents. In Figure A.1 we can see that the number of respondents that can be linked to their father is high, in particular, for the ages between 15–18, but decreases quickly for the older children. For instance we can only link about half of the 24-year olds in the sample to their fathers. Since we are analyzing an inter-generational effect of the fathers' education on their children, data availability on both generations is a binding restriction. Given this limitation, our main sample is composed of respondents in the civilian population who are between the age of

19–21 years old and who can be linked to their parents (their fathers in particular). From Figure A.1 we can see that the majority of youth at this age range are linked to their fathers.

In our context, the treated respondents (children in this case) are those whose fathers belong to the draft avoiders cohort. Card and Lemieux (2001) provide evidence that "draft-avoidance behaviour had little or no effect on the average schooling outcomes of men born after 1950." Hence, our main treatment group are the children of those men who were born between 1945–1950 under risk of conscription in the Vietnam War. Grimard and Parent (2007) also use the same birth years to construct their treatment group. Differently from the above two papers, Angrist and Chen (2011) use the birth years 1948–1953 to define the treated cohorts, instead of 1945–1950. However, the aim of their paper is to estimate the GI Bill benefits on the later life outcomes of Vietnam War veterans rather than those who avoided service. Given the two different approaches, we use four different treatment definitions to include all fathers affected who faced some level of risk: Fathers born 1945–1950, 1945–1951, 1945–1952 and 1945–1953. A chronology of the draft lottery events is summarized in Table A.1. We omit the respondents whose fathers were born before 1935. In this way we prevent the confounding effects that may originate from older father cohorts who were at risk of conscription in the previous war periods (Grimard and Parent, 2007), and especially the Korean war during which education deferments were also granted.

In this paper the outcome of interest is the probability of attending or enrolling in any PSE program for the individuals who can be linked to at least their male parent in the survey and are between 19–21 years old. CPS followed a different (and inconsistent) classification for the education variables in the surveys prior to 1992. For this reason, we provide a set of results that we compute using all surveys relevant to our paper (1981–2014) and another set of results where we use only surveys after 1992. In the first set of results, we are not able to distinguish between the different levels of post-secondary education of the parents. The education categories available for all survey years and for all respondents (both children and their parents) are the same. The educational categories are the following: less than high school diploma (Less than HS), high school diploma (HS), and post-secondary education (PSE). The later category includes any level of PSE for any number of years completed regardless of whether the respondent graduated or not from the program. In the second set

of results we are able to differentiate between the different PSE levels of the fathers and explore the heterogenous inter-generational effects by education level, but in doing so we loose one fourth of the sample. The PSE categories provided in the surveys post-1992 are the following: some years of college but no degree (Coll ND), Associate's degree occupational/vocational or academic program (Assoc), First Professional Degree (FirstProf), Bachelor's degree (Bach), graduate degree which includes Master's and doctoral degree (Grad).

Table 1 contains the summary statistics (mean and standard deviation) for the outcome and control variables that we use in our regression analysis. The average age in our sample is almost 20 years old, 46% of the respondents are female, 98% are single, 71% are White, 7% are Black and 15% are Hispanic. Mixed races are the omitted category. Given the young age, 97% of the respondents do not have any children of their own, but almost 78% have at least a sibling or more. Our final estimation sample is restricted to the respondents whose fathers were born between 1935–1965. The average fathers' age in the sample is 49 years old and the average mothers' age is 46 years old. Almost half of the parents have high school education or less. Around one third of the fathers are born during the Vietnam war risk years 1945–1953. Among all fathers in our sample 86% did not serve in the Vietnam War, i.e. 14% are Vietnam Veterans. However, for the sub-sample of fathers born during the risk years, this proportion is one third.

4   Education Attainment Trends

The descriptive analysis in this section provides evidence to support our identification strategy. The sample we use here is different from the sample that we use in our regression analysis. In this section our interest is in documenting the educational attainment trends over the different cohorts. Therefore, we use all individuals in the civilian population that are older than 25 years old. This is the only restriction imposed on the sample that we use in this section. First we analyze the cohort trends of educational attainment rates by birth year for all respondents in the survey for different PSE levels. We then decompose them further by veteran status.

Figure 2 displays the proportion of tertiary education attainment separately by gender.

Table 1: Summary Statistics - Mean (Standart Deviation)

	Child		Father		Mother	
Less than HS	0.19	(0.39)				
HS	0.25	(0.44)				
PSE	0.56	(0.50)				
Age	19.88	(0.81)				
Female	0.46	(0.50)				
White	0.71	(0.45)				
Black	0.07	(0.26)				
Hispanic	0.15	(0.35)				
Own children present: 0	0.97	(0.17)				
Own children present: 1	0.03	(0.16)				
Own children present: 2	0.00	(0.06)				
Siblings: 0	0.22	(0.42)				
Siblings: 1	0.40	(0.49)				
Siblings: 2	0.23	(0.42)				
Siblings: 3	0.09	(0.29)				
Siblings: 4	0.03	(0.17)				
Siblings: 5	0.01	(0.11)				
Siblings: 6	0.01	(0.07)				
Father Adoptive	0.02	(0.13)				
Mother Adoptive	0.01	(0.08)				
Single	0.98	(0.14)				
Residence in Metropolitan City Centre	0.19	(0.40)				
Residence in Metropolitan Out of City Centre	0.43	(0.49)				
Region: New England	0.10	(0.30)				
Region: Middle Atlantic	0.14	(0.35)				
Region: East North Central	0.14	(0.35)				
Region: West North Central	0.10	(0.30)				
Region: South Atlantic	0.15	(0.36)				
Region: East South Central	0.05	(0.21)				
Region: West South Central	0.08	(0.28)				
Region: Mountain	0.09	(0.29)				
Region: Pacific	0.14	(0.35)				
House Ownership	0.86	(0.35)				
Income per capita	20286.76	(18109.66)				
Father Less than HS			0.25	(0.43)		
Father HS			0.23	(0.42)		
Father PSE			0.52	(0.50)		
Father born 1945-1950			0.21	(0.41)		
Father born 1945-1951			0.24	(0.43)		
Father born 1945-1952			0.28	(0.45)		
Father born 1945-1953			0.32	(0.47)		
Father No Service in Vietnam War			0.86	(0.34)		
Father born 1945-1950 & No Service in Vietnam War			0.14	(0.35)		
Father born 1945-1951 & No Service in Vietnam War			0.17	(0.37)		
Father born 1945-1952 & No Service in Vietnam War			0.20	(0.40)		
Father born 1945-1953 & No Service in Vietnam War			0.23	(0.42)		
Father age			48.55	(5.62)		
Father White			0.72	(0.45)		
Father Black			0.08	(0.26)		
Father Hispanic			0.14	(0.35)		
Mother Less than HS					0.27	(0.44)
Mother HS					0.25	(0.43)
Mother PSE					0.49	(0.50)
Mother age					46.11	(5.35)

The two vertical lines mark the birth years with a high risk of conscription in the first Vietnam-era lottery held in 1969. While women have a smooth increase in the attendance rates, as reported in Card and Lemieux (2001), we see a sudden increase in the proportion of men born between 1945–1950 who attained a Bachelor's degree, an associate's degree, and also those who attended some years of college but did not complete the program. However, the proportion of men with a graduate degree (Master's or PhD) or a first professional degree decreases for the cohorts affected by the lottery. This is consistent with the fact that educational deferments were not issued for these programs. Unlike the hump-shaped plot that we see in the graph for men, the trend of education attainment for females is rather smooth. The proportion attending PSE is increasing for all PSE categories. Finally, notice that, in both graphs of Figure 2 a similar hump shape can be seen for those born in late 1960s and in the 1970s for the Bachelor's degree attainment rates and for attending some college but not completing the program (Coll ND). This is not the case for the other PSE programs. Figure 3 plots the ratio of attendance rates between men and women. We can see the same hump shape for Bachelor's degree attainment with a gender gap in attendance indicated by ratios bigger than one.

Figure 4 plots the proportion of men who have some PSE for each educational level. We plot separately those who served in the Vietnam war and those who did not. In this graph we can easily see that those who were born in the years (1945–1950), at risk of conscription during the Vietnam-era lottery but who also managed to avoid service due to pure luck or deferment, have a much higher attendance rate. This is obvious in particular for the Bachelor's degrees. There is a steep jump as high as nine percentage points. The trends in education attainment categories are very different for those men who were born between 1945–1950 but who served in the Vietnam war, i.e.Vietnam war veterans. Their rates of Bachelor's or graduate degree attainment are much lower and decreasing for the younger cohorts. However, the proportion with an associate's degree and with some years of college but no degree or diploma is higher and increasing for the veterans. We reproduce these three plots with more survey years and more data, using CPS 1981–2014. We display these plots (Figures A.2, A.3, A.4) in the appendix. Since the education variables are not consistent for the survey years prior to and since 1992, we can only compare consistently across surveys three education levels: any level

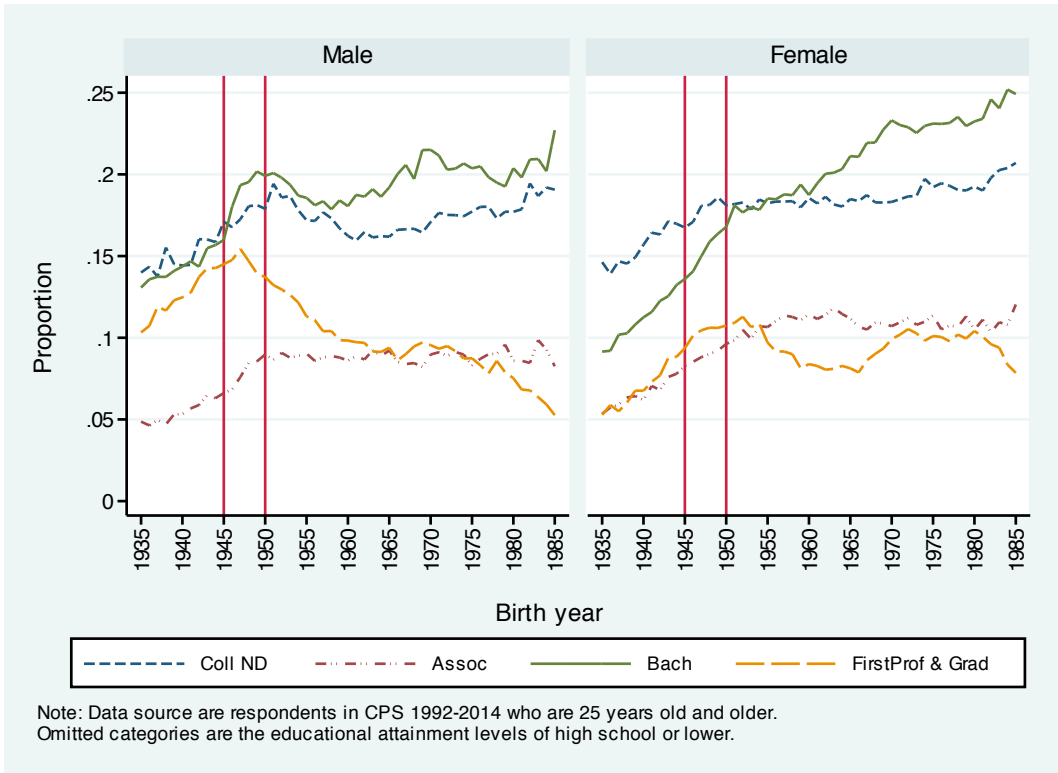Figure 2: Proportion attending tertiary education by birth year

Figure 3: Men to women ratio of the proportion attending tertiary education by birth year
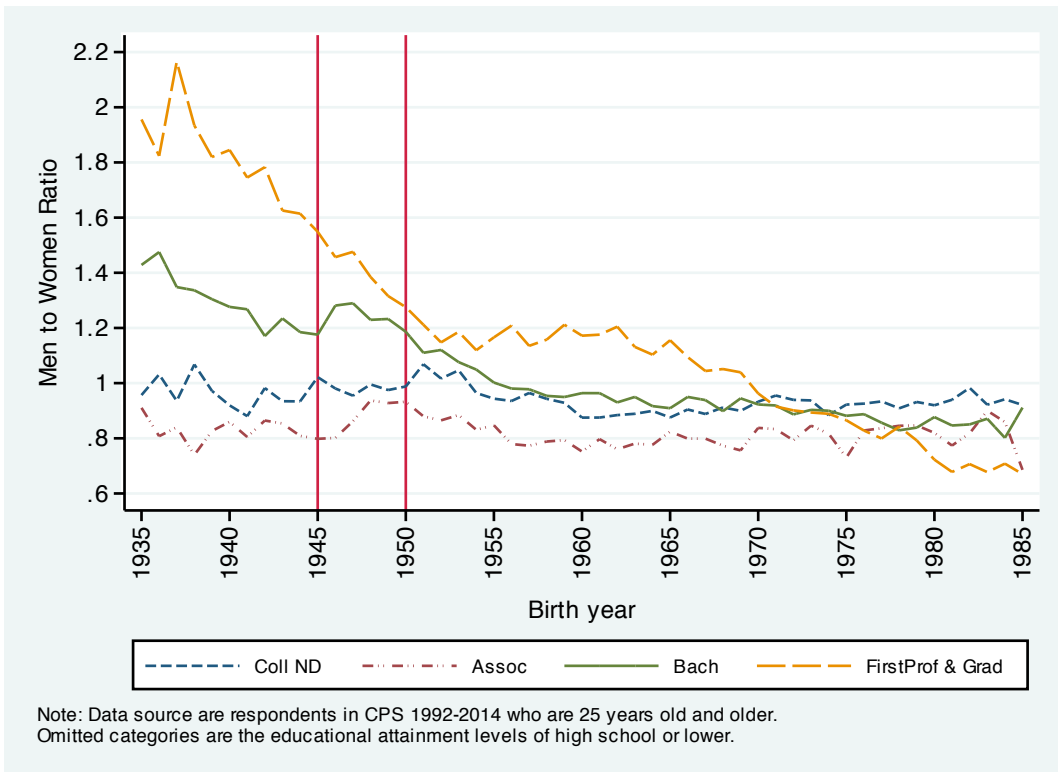
Figure 4: Proportion of men attending tertiary education by birth year and Vietnam-era service status

Note: Data source are respondents in CPS 1992-2014 who are men of age 25 and older.
Omitted categories are the educational attainment levels of high school or lower.
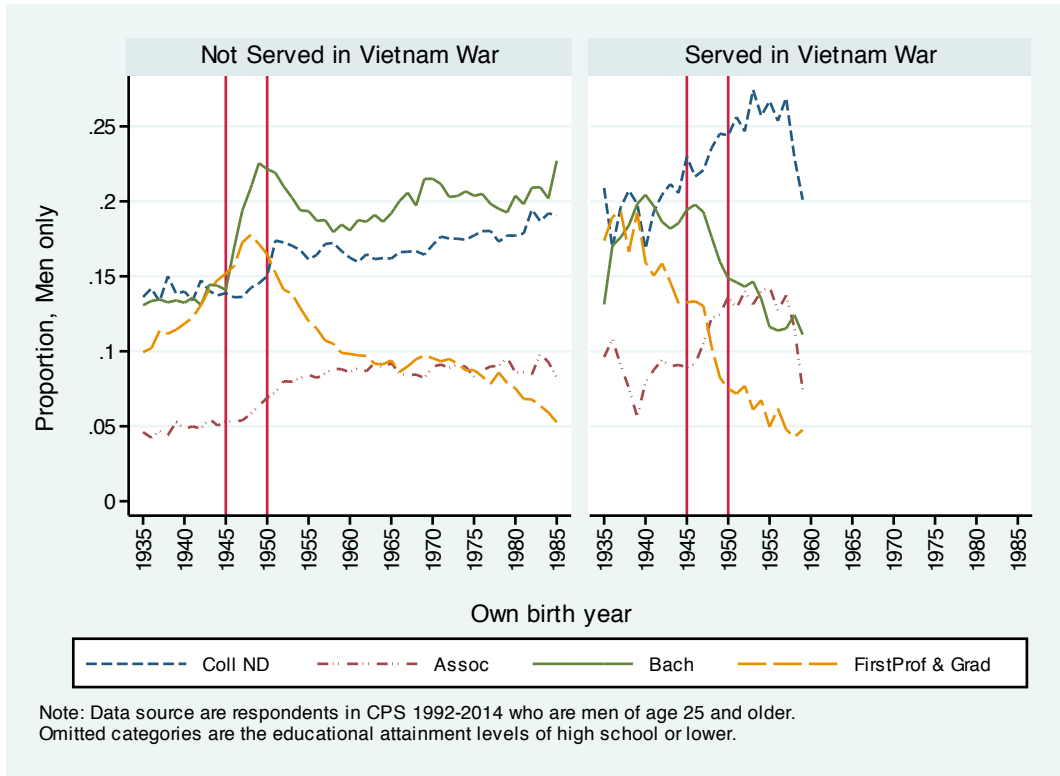
of PSE (including graduate studies, with or without degree/diploma), high school diploma (HS) and less than high school diploma (Less than HS). The plots show a very similar picture regarding the PSE attendance rates.

Hence, similar to the evidence built and presented in Card and Lemieux (2001), the plots suggest that, indeed, men under risk of being drafted in the Vietnam war exploited the educational deferments (prolonged their studies or enrolled in a PSE program) and avoided the draft. This is the source of exogenous variation that we use to identify the estimates of inter-generational transmission of PSE attendance in the next section. This is also the point where the analysis in this paper departs significantly from that in Card and Lemieux (2001).

5   Empirical Results

In this section we discuss the empirical results. Given the limitation that in household surveys like CPS the link between children and parents is lost after the children leave home, we chose to use only the respondents who are 19–21 years old. The educational outcome we analyze is

the probability of attending a post-secondary program at this age. Our dependent variable takes a value of one if the child is enrolled in a PSE program, and zero if they report a lower level of education.

First, we restrict the sample by father's level of education and compare the "normal" cohorts to the draft avoiders' cohorts conditional on the fathers having the same level of education for all cohorts. Hence, we use only the sub-sample of respondents whose father has at least some level of post-secondary education. In this way we are comparing the inter-generational transmission of educational attainment of fathers who were born during the draft lottery risk years and who faced a strong incentive to enrol in PSE due to this exogenous shock, to that of those who faced the "usual" incentives to attend PSE. We can refer to this latter group of fathers as those who would "normally" choose to attend PSE.

The treatment in this case is having a father who belongs to one of the cohorts that faced the risk of conscription due to the Vietnam Draft Lottery. Even though we think that the individuals most affected by the educational deferments are those born between 1945–1950 as is also shown in Card and Lemieux (2001), we also show results for the birth years 1945–1951, 1945–1952 and 1945–1953. The reason for the separate treatments is that for the three later birth years, 1951, 1952 and 1953, the educational deferment started to phase out and thus the incentive to enrol in a PSE program were less strong.

The estimation results of equation (1) are displayed in Table 2. In this first set of estimates we restrict $\gamma_3 = 0$, not allowing for heterogenous effects. We are interested in the estimate of γ_2, which captures the differential impact (beyond parental education) of attending college in order to be able to qualify for the educational deferment, and so avoid being drafted. The treatment indicator in Table 2 pools together the fathers who served (veterans) and those who did not serve during the Vietnam war, among which also potential avoiders. The comparison group includes the respondents whose father belonged to cohorts that did not face risk of conscription due to the Vietnam War Draft Lottery (i.e. who were born before or after the lottery risk birth years), and who have attained at least some level of PSE. From the estimates of Table 2 it is obvious that there is a high correlation between mothers' education attainment and their children's probability of attending PSE. Our main interest, is in the estimates of the first four rows. All coefficients are statistically insignificant.

This result indicates that the inter-generational transmission of education from fathers to their children is not statistically different for potential draft avoiders, who faced an additional incentive to attend PSE, than for fathers who chose in normal circumstances to attend PSE. Under the nature hypothesis, the extra incentive of avoiding the draft would be expected to draw individuals from the lower part of distribution of "innate ability" to attend PSE and so one would expect a lower rate of transmission of education from the fathers of the cohort at risk of being drafted. Since this is not observed, the alternative hypothesis that it is nurture, as reflected by increased levels of education, offers a better explanation for the tendency of the inter-generational transmission of education.

In Table 3, the definition of the treatment variable separates the veteran fathers from those who did not serve in the Vietnam War, all conditional on having at least some level of PSE. This definition approximates better the father's "potential avoider" status. The comparison group in this specification, differently from what we have in Table 2, includes the respondents whose fathers served in the Vietnam war and hence are veterans. In all cases, not only are the children with fathers from the cohort of potential draft avoiders as likely to attend PSE as are the children with fathers who obtain PSE under normal circumstances, but they are even more likely to attend PSE. The additional tendency, at about 2%, is modest but statistically significant.

Referring to equation (1), so far we abstract from allowing heterogeneity by father's educational level in the inter-generational transmission coefficient, i.e. we set $\gamma_3 = 0$. In Table 4, we show the estimates that allow the coefficient on the treatment variable to differ by father's level of higher education. In order to do that, we have to restrict our sample to the surveys conducted between 1992–2014, for which the program-based education variable is available. This explains the drop in the number of observations. We create a dummy variable to indicate the education levels (and types of education) that did not qualify for deferments. This variable takes a value of zero if the father has an educational level for which deferment could be granted. These are some college but no degree, associate vocational degree or diploma and Bachelor's degree. This variable takes a value of one if the father has a first professional degree, a Master's or a PhD degree, for which educational deferment were not issued. In Table 4 we interact this indicator variable with the treatment variable.

Table 2: Average marginal effects when treatment is having a father who is born in the risk years

	(1)	(2)	(3)	(4)
Father born 1945-1950	0.006			
	(0.01)			
Father born 1945-1951		0.001		
		(0.01)		
Father born 1945-1952			-0.001	
			(0.01)	
Father born 1945-1953				0.002
				(0.01)
Mother HS	0.061***	0.061***	0.061***	0.061***
	(0.01)	(0.01)	(0.01)	(0.01)
Mother PSE	0.167***	0.167***	0.167***	0.167***
	(0.01)	(0.01)	(0.01)	(0.01)
Observations	44338	44338	44338	44338
R^2	0.13	0.13	0.13	0.13

Note: Each column corresponds to a different regression and displays the logit average marginal effect. Results are weighted. Data source: CPS 1981–2014 March surveys. Sample is restricted to include the children whose fathers have some level of PSE and are born between 1935–1965. The covariates not displayed in the table are: constant term, female dummy, race dummies for White, Black and Hispanic, single marital status, dummies for number of children and number of siblings, own age and its square, metropolitan city centre residence dummy, metropolitan out of city centre residence dummy, house ownership dummy, yearly income per capita and its square, birth year and survey year dummies.

Table 3: Average marginal effects when treatment is having a father who is born in the risk years, but who did not serve in the War

	(1)	(2)	(3)	(4)
Father born 1945-1950 & No Service in Vietnam War	0.022***			
	(0.01)			
Father born 1945-1951 & No Service in Vietnam War		0.014**		
		(0.01)		
Father born 1945-1952 & No Service in Vietnam War			0.013**	
			(0.01)	
Father born 1945-1953 & No Service in Vietnam War				0.016***
				(0.01)
Mother HS	0.061***	0.061***	0.061***	0.061***
	(0.01)	(0.01)	(0.01)	(0.01)
Mother PSE	0.167***	0.167***	0.167***	0.167***
	(0.01)	(0.01)	(0.01)	(0.01)
Observations	44338	44338	44338	44338
R^2	0.13	0.13	0.13	0.13

Note: Each column corresponds to a different regression and displays the logit average marginal effect. Results are weighted. Data source: CPS 1981–2014 March surveys. Sample is restricted to include the children whose fathers have some level of PSE and are born between 1935–1965. The covariates not displayed in the table are the same as those noted in the footnote of Table 2.

The coefficient on the treatment variable that is not interacted, provides the effect associated with the omitted category, which in this case are the education levels that qualified for deferment. As expected the coefficients are higher in this specification for the first regression in particular, but almost the same as before for the other two. The coefficient is not significant on the interaction term with the programs that did not qualify for deferment.

Table 4: Average marginal effects as in Table 3, but allowing for heterogenous effects by father's educational level

	(1)	(2)	(3)	(4)
Father born 1945-1950 & No Service in Vietnam War	0.025***			
	(0.01)			
Father born 1945-1950 & No Service in Vietnam War*FirstProf and Grad	-0.027			
	(0.02)			
Father born 1945-1951 & No Service in Vietnam War		0.013		
		(0.01)		
Father born 1945-1951 & No Service in Vietnam War*FirstProf and Grad		-0.010		
		(0.02)		
Father born 1945-1952 & No Service in Vietnam War			0.012*	
			(0.01)	
Father born 1945-1952 & No Service in Vietnam War*FirstProf and Grad			-0.004	
			(0.01)	
Father born 1945-1953 & No Service in Vietnam War				0.015**
				(0.01)
Father born 1945-1953 & No Service in Vietnam War*FirstProf and Grad				0.001
				(0.01)
Father FirstProf and Grad	0.042***	0.040***	0.038***	0.037***
	(0.01)	(0.01)	(0.01)	(0.01)
Mother FirstProf and Grad	0.234***	0.234***	0.234***	0.234***
	(0.02)	(0.02)	(0.02)	(0.02)
Mother Bach	0.232***	0.232***	0.233***	0.232***
	(0.02)	(0.02)	(0.02)	(0.02)
Mother Assoc	0.191***	0.191***	0.191***	0.191***
	(0.02)	(0.02)	(0.02)	(0.02)
Mother Coll ND	0.189***	0.189***	0.189***	0.189***
	(0.02)	(0.02)	(0.02)	(0.02)
Mother HS	0.107***	0.107***	0.107***	0.107***
	(0.02)	(0.02)	(0.02)	(0.02)
Observations	35196	35196	35196	35196
R^2	0.11	0.11	0.11	0.11

Note: Each column corresponds to a different regression and displays the logit average marginal effect. Results are weighted. Data source: CPS 1992–2014 March surveys. Sample is restricted to include the children whose fathers have some level of PSE and are born between 1935–1965. The covariates not displayed in the table are the same as those noted in the footnote of Table 2.

In Table 5 we show another specification that allows for heterogenous effects if the father is adoptive rather than otherwise. This information is available only for the survey years 2007–2014, thus the significant drop in the number of observations. The parameter estimate on the interaction term is statistically indistinguishable from zero, indicating no differential inter-generational effect from a biological father. This is further support to the nurture

hypothesis.

Table 5: Average marginal effects as in Table 3, but allowing for heterogenous effects by father's biological/adoptive status

	(1)	(2)	(3)	(4)
Father born 1945-1950 & No Service in Vietnam War	0.061***			
	(0.02)			
Father born 1945-1950 & No Service in Vietnam War*Adoptive	-0.009			
	(0.07)			
Father born 1945-1951 & No Service in Vietnam War		0.041**		
		(0.02)		
Father born 1945-1951 & No Service in Vietnam War*Adoptive		-0.019		
		(0.07)		
Father born 1945-1952 & No Service in Vietnam War			0.025	
			(0.02)	
Father born 1945-1952 & No Service in Vietnam War*Adoptive			0.018	
			(0.06)	
Father born 1945-1953 & No Service in Vietnam War				-0.002
				(0.02)
Father born 1945-1953 & No Service in Vietnam War*Adoptive				0.045
				(0.05)
Father Adoptive	-0.033**	-0.032**	-0.035**	-0.038**
	(0.02)	(0.02)	(0.02)	(0.02)
Mother Adoptive	-0.088***	-0.087***	-0.087***	-0.087***
	(0.02)	(0.02)	(0.02)	(0.02)
Observations	12551	12551	12551	12551
Pseudo R^2	0.10	0.10	0.10	0.10

Note: Each column corresponds to a different regression and displays the logit average marginal effect. Results are weighted. Data source: CPS 2007–2014 March surveys. Sample is restricted to include the children whose fathers have some level of PSE and are born between 1935–1965. The covariates not displayed in the table are the same as those noted in the footnote of Table 2.

In Tables A.2 , A.3 and A.4 we present another set of estimates, in which the fathers that served in the Vietnam War were omitted from the estimation sample. This serves as a robustness check of whether the results we presented so far were instead driven by the presence of the veterans in the data. The coefficients are insignificant and smaller for most cases, except for the first regression in each table. In this regression the treatment definition is based on the fathers' birth years 1945–1950, for which the incentive of enrolling into PSE to avoid the draft was highest.

Overall, the results point not only to the treatment of fathers' birth years being 1945-50 leading to no drop in the transmission of PSE attendance relative to other fathers in the sample who had the normal incentives to attend PSE, but an increase in the rate of transmission, albeit a modest one of about 2%.

6   Conclusion

In this paper we analyze whether there is a causal effect of parental education on their children's educational attainment. In the spirit of Black et al. (2009) but in a different context, we use a natural experiment to identify an inter-generational causal relationship. We are able to address the question of whether this effect is genetic (nature argument) or environmental (nurture argument). The work of Card and Lemieux (2001) suggests that draft-avoidance behaviour (rather than the post-service GI Bill benefits) lead to the observed sudden increase in educational attendance and attainment observed during the mid 1960s to mid 1970s. Men who were at risk of being drafted had a strong incentive to enrol in a PSE program in order to obtain a deferment and avoid serving in the Vietnam War. Since the lottery induced an enrolment incentive for those men who would not have enrolled in a PSE program in the absence of the lottery, the Vietnam Era Draft Lottery serves as a natural experiment.

In this paper we track whether the PSE education transmission rate from these men to their children and compare to that for men who faced normal incentives to attend PSE. The treatment is having a father who was born during the years 1945-1950. We find evidence, contrary to expectations of the nature hypothesis, that the transmission rate of fathers' PSE educational attainment is not less than for those fathers born outside this period (i.e., not in the treatment group). In fact, we find a modest increase in the transmission rate for the treatment group. Therefore, the evidence is more consistent with the nurture hypothesis. Hence, we conclude that the source of the correlation between the parental education and the educational attainment of their children is in fact due to the educational attainment per se. From a policy perspective, the inter-generational multiplier effects that this may generate are of interest in poverty alleviation and inequality reduction initiatives.

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Appendix

Table A.1: Chronology of the Vietnam War Era (Aug. 1964 – Apr. 1975) Draft Calls

Year	Event	Veterans Birth years affected	Age	Selection for drafting
1964–Nov.1969	The draft selection - No lottery	1939–1950	19–25	Set by the president by order of dates of birth, *oldest to youngest*
around 1967	*Educational deferments no longer granted for any graduate and first professional degrees.*[2]			
Dec. 1, 1969	First Draft issued	1944–1950	19–25	Lottery numbers issued
Apr. 1970	*President M. Nixon announced a college-deferment phase-out.*			
Dec. 1970	Second Draft issued	1951	19	Lottery numbers issued
Sep. 1971	*Educational deferments ended.*			
Dec. 1971	Third Draft issued	1952	19	Lottery numbers issued
Dec. 7, 1972	No draft calls issued	1953	19	Lottery numbers issued

Note: Men who reached the age of 18 and reported to the Draft Board Draft Board were issued deferments for a few reasons such as: Education, dependent children, health. After classified "available for service", men were required to undergo a pre-induction test. Those who passed the test, were liable for service. They had the option to volunteer and choose the service. Volunteers qualified for shorter period of service. Maximum years of service were three, unless the individual volunteered for longer.

Figure A.1: Density of observations for each age of the children who are and are not linked to their fathers

Note: Data source are respondents in CPS 1981-2014 who are 15-80 years old. All educational levels included.
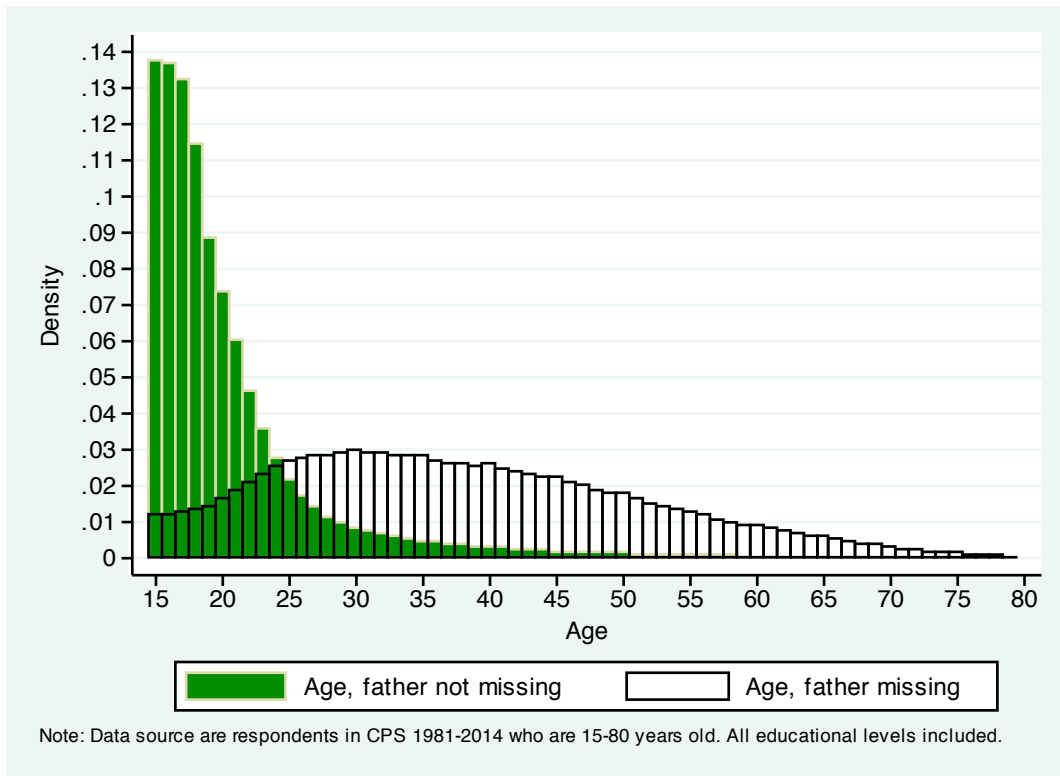
Figure A.2: Proportion by education level and birth year

Note: Data source are respondents in CPS 1981-2014 who are 25 years old and older.

Figure A.3: Men to women ratio of the proportion attending each education level

Note: Data source are respondents in CPS 1981-2014 who are 25 years old and older.
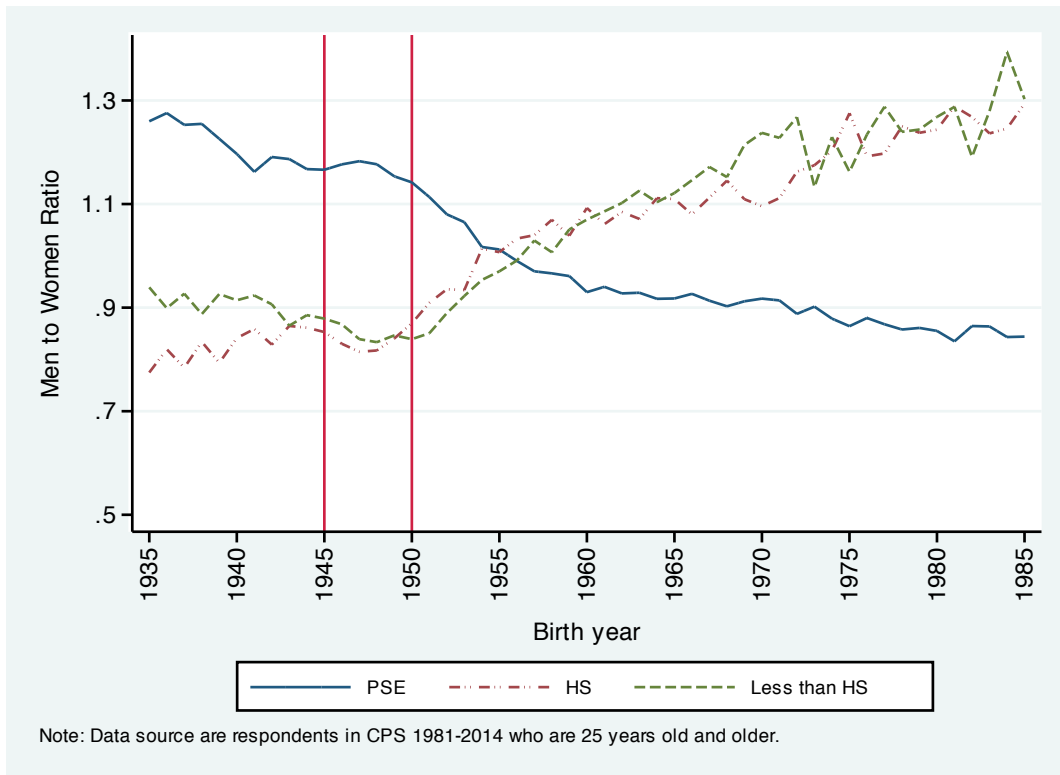
Figure A.4: Proportion of men attending each education level by Vietnam Veteran status

Note: Data source are respondents in CPS 1981-2014 who are men of age 25 and older.
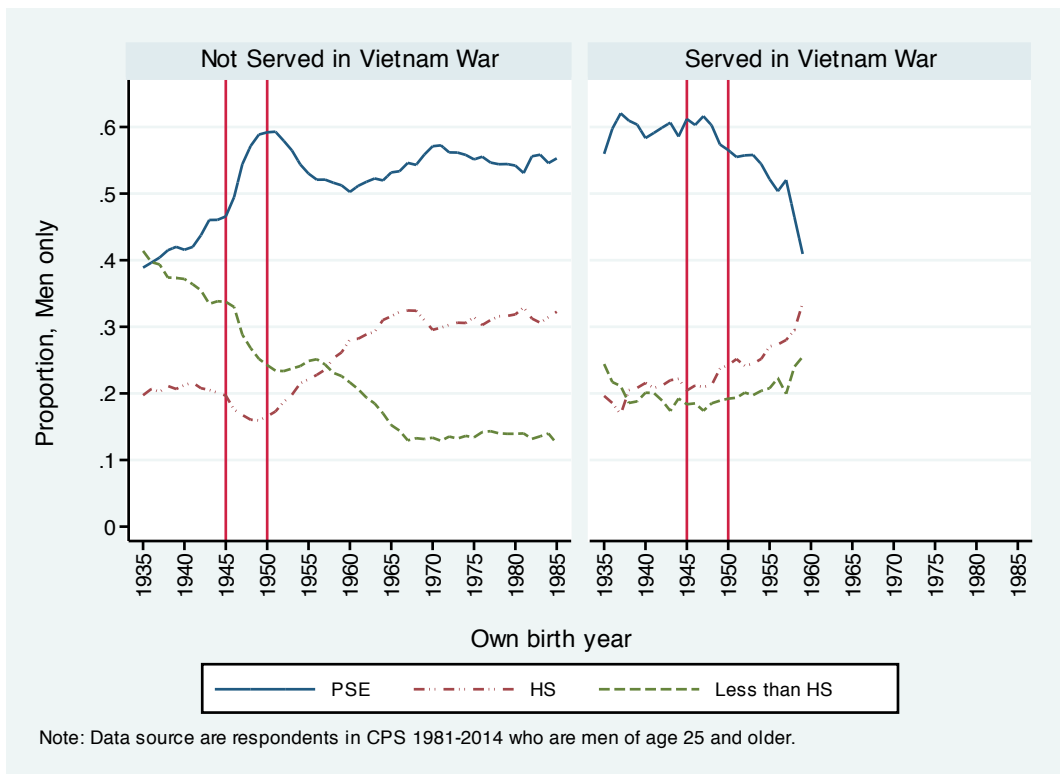
Table A.2: Average marginal effects when treatment is having a father who is born in the lottery risk years, Vietnam veterans excluded from the sample

	(1)	(2)	(3)	(4)
Father born 1945-1950 & No Service in Vietnam War	0.015**			
	(0.01)			
Father born 1945-1951 & No Service in Vietnam War		0.006		
		(0.01)		
Father born 1945-1952 & No Service in Vietnam War			0.006	
			(0.01)	
Father born 1945-1953 & No Service in Vietnam War				0.008
				(0.01)
Mother PSE	0.156***	0.156***	0.156***	0.156***
	(0.01)	(0.01)	(0.01)	(0.01)
Mother HS	0.049***	0.049***	0.049***	0.049***
	(0.01)	(0.01)	(0.01)	(0.01)
Observations	37308	37308	37308	37308
Pseudo R^2	0.13	0.13	0.13	0.13

Note: Each column corresponds to a different regression and displays the logit average marginal effect. Results are weighted. Data source: CPS 1981–2014 March surveys. Sample is restricted to include the children whose father's have some level of PSE and are born between 1935–1965. The covariates not displayed in the table are the same as those noted in the footnote of Table 2.

Table A.3: Average marginal effects as in Table A.2 and allowing for heterogenous effects by father's educational level, Vietnam veterans excluded from the sample

	(1)	(2)	(3)	(4)
Father born 1945-1950 & No Service in Vietnam War	0.020**			
	(0.01)			
Father born 1945-1950 & No Service in Vietnam War*FirstProf and Grad	-0.021			
	(0.02)			
Father born 1945-1951 & No Service in Vietnam War		0.007		
		(0.01)		
Father born 1945-1951 & No Service in Vietnam War*FirstProf and Grad		-0.003		
		(0.02)		
Father born 1945-1952 & No Service in Vietnam War			0.007	
			(0.01)	
Father born 1945-1952 & No Service in Vietnam War*FirstProf and Grad			0.003	
			(0.02)	
Father born 1945-1953 & No Service in Vietnam War				0.010
				(0.01)
Father born 1945-1953 & No Service in Vietnam War*FirstProf and Grad				0.010
				(0.01)
Father FirstProf and Grad	0.038***	0.034***	0.032***	0.030***
	(0.01)	(0.01)	(0.01)	(0.01)
Mother FirstProf and Grad	0.203***	0.203***	0.203***	0.203***
	(0.02)	(0.02)	(0.02)	(0.02)
Mother Bach	0.203***	0.204***	0.204***	0.204***
	(0.02)	(0.02)	(0.02)	(0.02)
Mother Assoc	0.161***	0.161***	0.162***	0.162***
	(0.02)	(0.02)	(0.02)	(0.02)
Mother Coll ND	0.166***	0.166***	0.166***	0.166***
	(0.02)	(0.02)	(0.02)	(0.02)
Mother HS	0.078***	0.078***	0.078***	0.078***
	(0.02)	(0.02)	(0.02)	(0.02)
Observations	29834	29834	29834	29834
R^2	0.11	0.11	0.11	0.11

Note: Each column corresponds to a different regression and displays the logit average marginal effect. Results are weighted. Data source: CPS 1992–2014 March surveys. Sample is restricted to include the children whose father's have some level of PSE and are born between 1935–1965. The covariates not displayed in the table are the same as those noted in the footnote of Table 2.

Table A.4: Average marginal effects as in Table A.2, but allowing for heterogenous effects by father's biological/adoptive status, Vietnam veterans excluded from the sample

	(1)	(2)	(3)	(4)
Father born 1945-1950 & No Service in Vietnam War	0.056**			
	(0.02)			
Father born 1945-1950 & No Service in Vietnam War*Adoptive	-0.012			
	(0.07)			
Father born 1945-1951 & No Service in Vietnam War		0.034		
		(0.02)		
Father born 1945-1951 & No Service in Vietnam War*Adoptive		-0.023		
		(0.07)		
Father born 1945-1952 & No Service in Vietnam War			0.017	
			(0.02)	
Father born 1945-1952 & No Service in Vietnam War*Adoptive			0.014	
			(0.06)	
Father born 1945-1953 & No Service in Vietnam War				-0.016
				(0.02)
Father born 1945-1953 & No Service in Vietnam War*Adoptive				0.042
				(0.05)
Father Adoptive	-0.035**	-0.033**	-0.036**	-0.040**
	(0.02)	(0.02)	(0.02)	(0.02)
Mother Adoptive	-0.090***	-0.089***	-0.089***	-0.090***
	(0.02)	(0.02)	(0.02)	(0.02)
Observations	11872	11872	11872	11872
Pseudo R^2	0.11	0.10	0.10	0.10

Note: Each column corresponds to a different regression and displays the logit average marginal effect. Results are weighted. Data source: CPS 2007–2014 March surveys. Sample is restricted to include the children whose fathers have some level of PSE and are born between 1935–1965. The covariates not displayed in the table are the same as those noted in the footnote of Table 2.