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family structure, female headed families, Civil War, natural experiments

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Abstract

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1 Introduction

In 1960, 8% of children lived in female-headed families; in 2004, 23% did (U.S. Bureau of the Census [77]).[1] Children who grow up without a father present tend to leave school earlier[2] and to earn less income as young adults[3]. They also exhibit more behavioral and psychological problems.[4] Glaeser and Sacerdote [26] find that the most important reason for higher crime in cities is the higher percentage of female headed families.

Why do children who grow up in female-headed families fare worse? One explanation is causal. Fathers act as role models and teach moral values (Haveman and Wolfe [32]). They help monitor children's behavior (Seltzer [72]) and invest time and money in a child's education (Becker and Tomes [5]). They may also provide information, advice, and access to social networks that help a child in the labor market (Barber [4]).

A second explanation is unobserved heterogeneity (Manski, McLanahan, Powers, and Sandefur [44]). Positive traits such as intelligence, physical and mental health, and responsible behavior make people more attractive and stable marriage partners. They are also passed on to one's children, via either heredity or parental behavior. This creates a correlation between growing up with a father present and having good outcomes in school and work, but it is not causal.

Which explanation is correct? The answer has implications for social policy. If children benefit from having a father present, then we can improve children's outcomes

[1] Willis [79] traces this trend to the increase in women's incomes in recent decades.

[2] See Astone and McLanahan [3]; Biblarz and Gottainer [7]; Case and Katz [8]; Ermisch and Francescone [16]; Manski, McLanahan, Powers, and Sandefur [44]; Peters and Mullis [62]; Ribar [66]; Sandefur, McLanahan, and Wojtkiewicz [68]; and Ver Ploeg [78].

[3] See Biblarz and Gottainer [7]; Corak [12]; Hill and Duncan [34]; Hill, Augustyniak, and Ponza [33]; Li and Wojtkiewicz [41]; McLanahan and Booth [47]; McLanahan and Sandefur [48]; and Powell and Parcel [64].

[4] Children in female-headed families are more likely to have poor relationships with their parents, to drop out of school, and to receive psychological help (Zill, Morrison, and Coiro [80]). They are also more likely to smoke (Kirby [35]), to use drugs (Needle, Su, and Doherty [59]), and to give in to peer pressure to steal, commit acts of vandalism, and cheat on examinations (Steinberg [74]).

by trying to keep families together. If the only reason is unobserved heterogeneity, then it would be better to focus on pregnancy prevention and education for disadvantaged young women.

This paper uses the U.S. Civil War as a natural experiment to study this issue. Most fathers survived the war and returned to their families. Others were less lucky. We show that death from violence in the Civil War was a random event. Hence, it can be used as a natural experiment to measure the causal effect of father absence on a child's outcomes. Our results support the view that children of absent fathers do poorly in the labor market because of unobserved heterogeneity. However, we do find evidence for a negative effect of a father's death on a daughter's educational attainment.

Others before us have used a father's death to study the effect of family structure on children's outcomes (see Biblarz and Gottainer [7]; Corak [12]; Gertler, Levine, and Ames [25]; and Lang and Zagorsky [36]).[5] However, as Corak [12] points out, premature death is not necessarily random. For instance, high school dropouts have the highest age-adjusted death rates—not only from disease, but also from homicide, suicide, and accidents (National Center for Health Statistics [57]). In contrast, we will show that violent death in the Civil War was truly random.

For our purposes, the Civil War has several advantages over modern wars. It was the last major U.S. war in which large numbers of fathers fought and died. We will show that these fathers came from a representative distribution of civilian jobs. In contrast, as of World War I fathers have been exempt from conscription.[6] Most fathers who fought in the wars of the 20th century were career military officers. Military families may have unique characteristics that make them less relevant to the general population.

In addition, 19th century data are less subject to privacy restrictions. Fathers who survived the war often came home with disabilities that reduced their incomes, wealth,

[5] In addition, Lyle [43] uses military deployments to estimate the effects of parental absence on children's test scores. He finds a slight negative effect.

[6] Most fathers took advantage of this exemption. We studied two random samples of children who were born just before one of the two World Wars. The fathers of these children were actually more likely to die *after* the war than during it. (See Appendix A for more details.)

and geographic mobility over subsequent decades (Costa [14], Lee [39, 40]). We are able to control for this using information on each surviving recruit's disabilities. Such information is harder to obtain for more recent wars.

Our study design also lets us isolate the pure effect of a father's physical absence on his children, uncontaminated by the psychological ill effects that hinder children whose absent fathers are still alive. A child whose mother is divorced, separated, or never-married may have low self-esteem due to feelings of rejection by his absent father. This is unlikely to be a problem for war orphans.[7] Moreover, death in war lacks the social stigma of divorce or illegitimacy.

Our study also abstracts, to a large extent, from the lost income that results from a father's absence. Civil War pensions replaced a nontrivial portion of the wages of a live father that would have been available for his family's consumption. In Appendix B, we estimate that the typical father consumed about 27% of his family's income. The remaining 73% would have been available to other family members. Civil War pensions did not replace all of this but they came close. The typical widow of a farm laborer received a pension that replaced approximately 64% of her husband's lost income (Appendix B). For widows of nonfarm laborers the estimate is 49% and for widows of white collar workers it is 46%.

For widows who remarried, the pension system provided overinsurance. Upon remarriage, a widow's pension devolved to her children (Sanger [70, p. 230]). Hence, for widows who retained custody of their children, household pension income would be unaffected by remarriage, while the family would benefit from the new husband's income.

Our findings are as follows. A father's violent death has essentially no effect on a child's labor market outcomes in 1880: it has no effect on the chance that a child will have a paying job or on the child's income from such a job. This holds for both boys and girls. A father's death did affect his child's investment in human capital, but only for girls: daughters of fathers who died violently were 1.3 to 1.5 percentage points less likely

[7] One may even think the opposite: that a father's heroic death in war may inspire a child. However, we find similar (non)effects of father's death on a child's income whether the father died violently or from disease, even though violent death would seem to be more heroic.

to be students in 1880.[8] These daughters appear to have had a higher chance of doing unpaid housework, though the increase is not statistically significant. Father's violent death has no effect on a son's chance of being a student or doing unpaid housework in 1880.

A father's death in the war did affect a child's family structure in 1880. Sons whose fathers died were less likely to live with their mothers in 1880 but daughters were not. A father's death did not affect his child's chance of being married in 1880. However, it did cause his married daughters to have 0.7 fewer children living with them in 1880. We find no such fertility effect on married sons.

Finally, a father's violent death reduced the number of siblings aged 18 and under living with a child in 1880. It had no significant imact on the number of siblings aged 19 and over living with the child. This appears to be a direct fertility effect: dead soldiers could not father any more children.

Most other studies have found that the correlation between family structure and children's outcomes is due wholly or in part to unobserved heterogeneity.[9] A few have found, instead, that the relationship is entirely causal.[10] We find that a father's violent death does not affect his child's labor market outcomes or his son's likelihood of being a student in 1880. This goes against the causal explanation. On the other hand, a father's violent death lowers his daughter's probability of being a student in 1880. This lends support to a causal explanation of the correlation between family structure and a child's education in the case of daughters.

Other studies have also found a correlation between father absence and out-of-wedlock childbirths. We are unable to study this issue with our data since having

[8] Overall, 9.7% of daughters in our sample were students in 1880. Thus, a father's violent death caused about a 13% to 16% fall in a daughter's chance of being a student in 1880. The youngest children in our sample were born in 1866, which would make them 14 years old in 1880. 4.7% of sons were students in 1880.

[9] Examples include Biblarz and Gottainer [7]; Cherlin et al [9]; Corak [12]; Ermisch and Francescone [16]; Lang and Zagorsky [36]; McLanahan and Booth [47]; Powell and Parcel [64]; and Ver Ploeg [78].

[10] See, e.g., Morrison and Cherlin [54]; Painter and Levine [60].

a child out of wedlock was virtually unheard of in the 19th century.[11] Because of the vast changes in social norms respecting the family, our findings that sons leave the home earlier and married daughters have fewer children may not be terribly relevant to modern-day developed countries. However, they may be relevent to the effects of father absence in developing countries.

2 Data

This study uses data collected by the Early Indicators of Later Work Levels, Disease, and Death project (henceforth EI), jointly sponsored by the National Institutes of Health, the Center for Population Economics at the University of Chicago, and Brigham Young University (Fogel [20, 21], Fogel et al [18], Costa [13]). The data consist of complete samples of all 35,570 white men recruited into 303 randomly chosen companies in the Union army. Union companies typically contained about 100 men, ranging from private (the lowest rank) up to captain and also containing noncombat personnel such as cooks, teamsters (wagon drivers), and musicians. Drury and Gibbons [15, p. 22] offer the following description:

> An infantry company was commanded by a captain with a 1st lieutenant, a 2nd lieutenant, a 1st sergeant, four sergeants, and eight corporals. ... Companies were also supposed to include two musicians. In the noise and smoke of a Civil War battlefield, officers and NCOs could shout themselves hoarse and still fail to make themselves heard. The shrill notes of bugles and fifes, and the rhythmic pounding of drums were useful because they could pierce the din.

[11] Only 0.5% of never-married sons in our sample had any children in 1880, compared to 77% of married sons. The figures for daughters are 0.6% and 76%, respectively.

Age Group	Recruits Found in 1860 Census	Northern White Men Aged 15+ in 1860 Census	
		All Men	Men With Occupation
10-14	0.4%	0.0%	0.0%
15	0.8%	3.3%	0.1%
16	1.8%	3.6%	2.2%
17	3.4%	3.2%	2.3%
18	11.7%	3.4%	2.8%
19	8.1%	3.1%	2.7%
20-24	30.4%	15.5%	15.4%
25-29	17.6%	14.2%	15.4%
30-34	11.0%	12.4%	13.7%
35-39	7.7%	10.3%	11.5%
40-44	5.9%	8.4%	9.3%
45-49	1.0%	6.5%	7.3%
50-54	0.2%	5.4%	6.0%
55-59	0.1%	3.5%	3.9%
60-64	0.0%	3.1%	3.4%
65+	0.0%	4.2%	3.9%
MEAN AGE	25.7	33.9	35.3

Figure 1: Age distributions of recruits (EI sample), Northern white men aged 15 and over (IPUMS), and the subset of the latter group with occupations (IPUMS). Age of recruit is age when first mustered into Union army. Age of other two groups is age in 1860.

2.1 Representativeness

Were Union army recruits representative of northern white males? Table 1 compares the age distributions of the EI recruits with the age distribution of Northern white males aged 15 and over in 1860.[12] This table shows that the recruits were on average younger and more likely to be between 18 and 29 years of age than the general population.

Tables 2 and 3 restrict to the 14,120 recruits who were located by Fogel et al [21] in the 1860 Census. Table 2 shows the occupational distribution of recruits, all Northern

[12]The age of a recruit is the age at which he was mustered (inducted) into the army. The sample of adult white Northern males comes from the IPUMS one percent sample of the 1860 Census (Ruggles et al [67]). We define the North as those states that were not in the Confederacy, which consisted of Alabama, Arkansas, Florida, Georgia, Lousiana, Mississippi, North and South Carolina, Tennessee, Texas, and Virginia (Rhodes [65]).

Occupation	Recruits Found in 1860 Census	Northern White Men Aged 15+ in 1860 Census	
		All Men	Men With Occupation
Farmer	27.6%	21.3%	24.3%
Nonfarm Laborer	20.0%	10.8%	12.7%
Farm Worker	19.6%	15.1%	19.5%
Craft	14.4%	14.6%	16.6%
Operative	9.6%	9.3%	10.8%
Clerk	1.9%	0.6%	0.7%
Apprentice	1.6%	1.4%	1.9%
Professional	1.5%	2.3%	2.6%
Manager/Proprietor	1.5%	3.8%	4.1%
Service Worker	1.4%	1.3%	1.6%
Student	0.4%	0.7%	0.9%
Sales	0.3%	3.4%	4.2%
Retired/Disabled	0.1%	0.0%	0.1%
Farm Foreman	0.1%	0.0%	0.0%
No Occupation	0.0%	15.3%	0.0%

Figure 2: Occupational distribution of recruits (EI sample), Northern white men aged 15 and over (IPUMS sample), and the subset of the second group who report occupations in the 1860 Census. Both samples of Northern white men are weighted so that their age distribution matches that of the recruits. Sample of recruits is limited to those found in the 1860 Census. Recruits' occupation is as coded in the 1860 Census.

adult white men, and the subset of the latter group who report occupations. Both sets of northern white men are weighted so that their age distribution matches that of the recruits. Recruits are more likely to have occupations and, conditional on having an occupation, they are overrepresented in the categories of farmers and nonfarm laborers. However, the differences are fairly small.[13]

[13]There are two sources for recruit's occupation: the 1860 Census and the the recruit's Military Service Record. The principal difference between the two sources is that the Census distinguishes between farmers and farm workers while the Military Service Record does not. Our main regressions use occupation from the Military Service Record since data from the 1860 Census is available for only about 40% of the recruits. However, Table 2 relies solely on a recruit's 1860 Census record in order to yield an occupational schema that is consistent with that of the comparison groups.

Table 3 compares other characteristics. Compared with Northern adult white men with occupations, recruits were less wealthy, both on a personal and household[14] basis, had slightly lower income and socioeconomic status[15], and were more likely to be literate. The reason recruits had less real and personal property seems to be the way men were recruited (see, e.g., Geary [24]). Before 1863, Northern states were given recruitment quotas by the Union government. They filled these quotas by paying bounties to young men and their families. These bounties would have been less appealing to wealthy men. In 1863, a national draft was instituted. Men could avoid service by paying $300 or by hiring a substitute. Wealthy men would have been more able to take advantage of these loopholes. The higher literacy and labor force participation rates of recruits could be due to the exemption given to the physically and mentally handicapped (Geary [24]).

2.2 The Randomness of Death

Our experimental design assumes that death in the Civil War was random. In practice, this was not true for certain types of death. Lee [38] shows that farmers were more likely to die from disease than nonfarmers since they came from healthy rural environments and thus lacked immunities. In this section we confirm Lee's findings. On the other hand, descriptions of Civil War combat suggest that violent death was more random:

> When the skirmish line was halted and the main battle lines engaged, precision shooting was impossible. Indeed, it was considered a major achievement to impose any fire control on a regiment once it became locked in combat with the enemy. ... while a regiment might manage to open a fight with a well-timed volley, this was usually followed by an uncontrolled fusillade. (Drury and Gibbons [15, p. 24])

[14] We follow Lee [38] in measuring financial well being for a household by total household wealth divided by the number of adult male equivalents in the household. Adult male equivalency is based on caloric intake in the 19th century, using the table from Fogel [19, p. 9]. For instance, a girl aged 5-9 consumed 2/3 the calories of an adult male, so she is regarded as 2/3 of an adult male equivalent.

[15] These variables are defined in Appendix C.

Characteristic	Recruits Found in 1860 Census	Northern White Men Aged 15+ in 1860 Census	
		All Men	Men With Occupation
Own Property (2003 $000)			
Real	4.2	9.6	9.9
Personal	2.0	5.5	5.7
Total	6.2	15.1	15.6
Household Property per Adult Equivalent (2003 $000)			
Real	6.6	9.5	9.2
Personal	2.6	4.7	4.6
Total	9.2	14.2	13.8
Own Annual Income (Including Zeroes) (2003 $000)			
	14.2	13.2	15.4
Socioeconomic Index	15.1	16.3	18.9
Literacy Rate	96.3%	95.3%	95.1%

Figure 3: Other characteristics of recruits (EI sample restricted to those found in 1860 Census), Northern white men aged 15 and over in 1860 (IPUMS sample), and the subset of the second group who report occupations in the 1860 Census. Both samples of Northern white men are weighted so that their age distribution matches that of the recruits. Recruits' income is based on recruits' occupation in 1860 Census.

In this section we show that death from violent causes is orthogonal to all of our measures of a recruit's social background. This suggests that violent death is indeed random for our purposes and can be used as a natural experiment.

The IE database includes more than one cause of death for some recruits. In this case, we treat a death as violent if any of its causes were violent. For instance, if the recruit died from a gunshot wound that later became infected, we treat this as a violent death.

We begin with death from disease. Table 4 compares recruits who died from illness with those who did not.[16] Stark differences emerge between the two groups. Recruits who died from illness are much more likely than other recruits to have been farmers before the war. They had lower prewar incomes and socioeconomic status and higher household wealth. They were also more likely to have been mustered as privates. Indeed, the wartime death rate from disease was 9.5% for privates versus 6.2% among nonprivates. This is because farmers, who were more disease-prone (Lee [38]), were also more likely to be inducted at the lowest rank of private (Lee [37]; see also Appendix D).

Table 5 performs the same exercise in the case of violent death. Recruits who died violently are very similar to those who did not. They have virtually the same occupational distribution, prewar income, prewar socioeconomic index, and household wealth per adult equivalent in 1860. They also have very similar ages when mustered, chances of having been mustered as privates, and heights at enlistment.

We conclude that Lee [38] is correct that death from disease was predictable, but that death from violence was essentially random. Accordingly, we focus primarily on violent death.

2.3 Finding the Children

The EI dataset contains three source of information on the children of recruits: the 1860 and 1870 Censuses and the pension applications of veterans and widows. In order to ensure comparable age distributions of orphans and nonorphans, we excluded children

[16] The latter group includes both recruits who died from violence and those who survived the war.

Recruit Characteristic	Died from Illness?	
	No	Yes
Occupational Distribution		
Farmer/Farm Worker	47.9%	66.1%
Craft	18.3%	13.2%
Nonfarm Laborer	16.0%	11.8%
Operative	10.1%	4.9%
Clerk	2.7%	1.2%
Professional	2.1%	1.7%
Manager/Proprietor	1.0%	0.4%
Student	0.6%	0.3%
Sales	0.4%	0.2%
Own Annual Income (2003 $000)	15.1	13.7
Socioeconomic Index	17.4	16.0
Household Property per Adult Equivalent (2003 $000)	9.2	9.8
Muster Age	25.6	26.2
Percent whose Initial Rank was Private	87.4%	91.5%
Height in Inches at Enlistment	67.5	68.0
N	32076	3196

Figure 4: Attributes of Civil War recruits by whether or not the recruit died from illness during the war. Recruits who did not die from illness include both recruits who survived the war and those who died violently during the war.

Recruit Characteristic	Died from Violence?	
	No	Yes
Occupational Distribution		
Farmer/Farm Worker	49.5%	51.1%
Craft	17.7%	19.4%
Nonfarm Laborer	15.7%	13.1%
Operative	9.6%	9.7%
Clerk	2.6%	2.4%
Professional	2.1%	1.9%
Manager/Proprietor	0.9%	1.0%
Student	0.6%	0.4%
Sales	0.3%	0.5%
Own Annual Income (2003 $000)	15.0	14.9
Socioeconomic Index	17.3	17.1
Household Property per Adult Equivalent (2003 $000)	9.2	8.9
Muster Age	25.7	25.2
Percent whose Initial Rank was Private	87.8%	87.2%
Height in Inches at Enlistment	67.5	67.7
N	33365	1907

Figure 5: Attributes of Civil War recruits by whether or not the recruit died from violence during the war. Recruits who did not die from violence include both recruits who survived the war and those who died from illness during the war.

born after 1866.

Family relationships are not explicit in the 1860 and 1870 Censuses. They must be inferred.[17] Fogel *et al* give the following guidelines [21, p. 54]:

> The head of each household is generally either the recruit himself, or else first household member.... Which of these two is the head of the household can be determined stochastically by age and last name. After the head of the household, individuals are listed in the following order:
>
> a) Spouse
>
> b) Children
>
> c) Other relatives
>
> d) Nonrelatives (including boarders)

We deem a household member to be a child of the recruit if the following conditions are both met:

- the first household member listed in the Census record, other than the recruit, is a woman with the same last name as the recruit and who is not more than 12 years older than the recruit (and thus cannot be the recruit's mother);
- the child is at least 13 years younger than the recruit and shares the recruit's last name.

In all the cases we have inspected, this algorithm produces a wife who is close in age to the recruit and children who are considerably (20+ years) younger. By construction, they all share the recruit's last name. The chance that we are misconstructing some family relationships appears to be negligible.

Using these rules, we found we found 5,435 daughters and 5,631 sons in the 1860 Census. The EI dataset has only partial coverage of the 1870 Census; we found 1,013 daughters and 1,084 sons in this source. Finally, the pension forms produced 6,978 daughters and 7,143 sons.

[17] Pension records include only the recruit's wife and children so no inference was needed.

There were a total of 11,900 distinct daughters and 12,041 distinct sons in the three sources.[18] However, while the pension records mention the daughters' later married names, the 1860 and 1870 Census records do not. We need these names in order to avoid selection bias at the next stage: when we search for the daughters in the 1880 Census. We therefore discarded daughters who were not mentioned in the pension records.[19] The final total was 6,978 daughters and 12,041 sons.

We then searched for each of the children in the 100% count of the 1880 census, which was obtained from the North American Population Project and the Minnesota Population Center [58].[20] In order to avoid selection bias, we ignored information about other household members in 1880. We required only that the following attributes of the child be the same in 1880 as in the source data: the first name, the last name, the birth year ± 1, the birth state or birth country if foreign born, and the mother's birth state or country. First names were standardized using code provided by Joseph Ferrie. For last names, we used the Double Metaphone algorithm (Phillips [63]) to convert the last names to their phonetic equivalents and then matched on these. We then used the Spedis algorithm (SAS Institute [71]) to eliminate pairs whose spelling was grossly different.[21] For instance, for a child named Byer, the phonetic first stage might yield matches to children named Bair and Beyer in 1880; the Spedis algorithm would then tell us that the match to Beyer was the more likely.

Summary statistics are as follows. For 29% of girls and 32% of boys, we found unique matches. Due to having common search keys, 36% of girls and 31% of boys

[18] The individual numbers do not add up to the respective totals as some children appeared in more than one source.

[19] Both widows and surviving veterans were eligible for pensions so this does not necessarily lead to selection bias. We check the existence of selection bias below.

[20] The 1880 Census was converted to electronic form by the Church of Jesus Christ of Latter Day Saints [10] in a project that lasted several decades.

[21] The Spedis algorithm yields a distance between two names that is determined by the number and type of letter substitutions and transpositions that are needed to convert one name to the other (SAS Institute [71, p. 827]).

were matched to more than one person in 1880. Finally, 35% of girls and 38% of boys were not located at all in 1880. Some of these may have died. Of children born in 1860, 19.7% died before reaching their first birthday and 28.1% died before reaching 10 years of age (Haines [28]). The Census undercount is also an issue: the 1880 Census is thought to omit as much as 10% of the U.S. population (Minnesota Data Center [53]). Finally, some of the children may have erred in reporting their birthplace or their parents' birthplaces, or their names may have been spelled very differently in the two sources.[22]

The existence of matches to more than one person implies that our approach sometimes yields incorrect matches. One may worry that this could also happen when our approach yields a unique match. That is, we may simply be matching to the wrong people in 1880. If so, the resulting measurement error would tend to bias any effect of father's death on a child's outcomes in 1880 towards zero. In Appendix E, we show that unique but incorrect matches are actually quite rare: when our approach locates a unique person in 1880, it is indeed the person we seek at least about 88% of the time. Consequently, this type of measurement error should not be a serious problem.

Characteristics of matched and unmatched children appear in Table 6. The universe is the full set of children found in the 1860 and 1870 Censuses and the pension records. The columns labeled Matched are the children for whom a unique match in 1880 was found. The columns labelled Unmatched consist of the rest of the children.[23] Overall,

[22] We would not find children if their names had a different phonetic structure in 1880. However, we do search for a child using his/her alternative surnames when these are known. For instance, the pension records might record a daughter's married name. In this case, we searched for females in 1880 who bore either the daughter's married name or her maiden name. Or the pension records might report a widow's surname from a subsequent marriage. In this case, we would search for the child in 1880 using both the original surname and the mother's new surname. In both cases, we used both alternatives since the EI study does not specify marriage dates for widows or their daughters.

[23] For both sexes, the Unmatched group includes children with no match or multiple matches in 1880. For girls, the Unmatched group also includes girls who were not present in the pension records and were thus dropped from the sample before the search took place. We include these girls because selection bias may have occurred at this earlier stage as well.

the figures are very similar for matched and unmatched children. This suggests that selection bias is not a problem.[24]

3 Results

3.1 Effects on a Child's Income

Table 7 shows the effects of a father's violent death on a son's income in 1880. We restrict to children with paying jobs; in the following section we study the effects of a father's death on a child's work status. In column 1, the universe is the set of all sons with paying jobs. The dependent variable is the log of the son's IPUMS income in 1880 (see Appendix C for a definition). Independent variables consist of a dummy variable that equals one if and only if the father died violently in the war; the log of the father's prewar IPUMS income; child's age and age squared in 1880; and dummy variables for father's initial military rank and company.[25]

Column 1 of Table 7 shows that controlling for father's initial rank and company, the elasticity of son's income with respect to father's income is 0.29. If we omit father's initial rank and company, this elasticity rises to 0.45 (results available on request). This estimate of the intergenerational elasticity of earnings is within the range of estimates from the literature, which have averaged about 0.4 (see Mazumder [46] for a review). This lends additional credence to our matching procedure.

In the specification of column 1, a father's violent death *raises* his son's income by a few percent. However, this effect disappears when better controls for social background

[24] Table 6 does show that matched daughters were somewhat younger than unmatched daughters. This may be because not all mothers recorded their married daughters' new surnames on their pension forms. Hence, we may be matching to more daughters who are unmarried in 1880. This may not create bias, however. If the chance of a daughter's married name being recorded is independent of whether or not the father died violently in the war, then this would not affect our results. This is likely since pension eligibility did not depend on a daughter's marital status.

[25] We omit the dummy variable for the miscellaneous rank. This rank consists primarily of cooks, musicians, and teamsters.

	Characteristic	SONS		DAUGHTERS	
		Matched	Unmatched	Matched	Unmatched
1	F Dishonorably Discharged	0.29%	0.44%	0.25%	0.38%
2	F Discharged due to Disability	19.5%	18.6%	16.9%	18.0%
3	F Died in War from Illness	11.2%	14.3%	14.2%	12.8%
4	F Died Violently in War	5.2%	6.5%	6.7%	6.6%
5	F Muster Age	33.9	34.2	32.0	34.6
6	F Muster Date	1863.3	1863.3	1863.4	1863.3
7	F Enlistment Term	2.48	2.48	2.41	2.48
8	F Height at Enlistment	68.3	68.3	68.1	68.2
9	F Prewar Inc. (2003 Dollars)	$14,689	$14,785	$14,708	$14,776
10	F Prewar SEI	16.9	17.0	17.2	17.0
11	F 1860 HH Assets Per Adult Equiv (2003 Dollars)	$5,621	$4,825	$5,678	$4,997
12	Child Age in 1880	22.5	23.1	20.0	23.3
13	F Initially Infantry	94%	93%	95%	93%
14	F Initial Rank is Private	86%	87%	88%	86%
15	F Farm Sector Before War	57%	55%	57%	56%
16	N	3822	8219	2004	9896

Figure 6: Characteristics of Matched and Unmatched Children. Unmatched daughters include those who are excluded from the matching procedure because they do not appear in the widows' pension records. Row 1 is the percent of children whose fathers were dishonorably discharged. Row 2 is the percent of children whose fathers were discharged due to disability. Row 3 shows the percent of children whose fathers died from illness during the war. Row 4 is the percent of children whose fathers died from violent causes during the war. Row 5 is the average age at which a child's father was mustered into the military. Row 6 gives the mean muster date. Row 7 gives the mean number of years that the father initially committed to serve in the military. Row 8 gives the father's height at enlistment in inches. Row 9 gives the father's annual IPUMS income from his prewar occupation, in 2003 dollars. Row 10 gives the father's prewar socioeconomic index (SEI). IPUMS income and SEI are defined in Appendix C. Row 11 gives household assets per adult equivalent in the father's 1860 household in 2003 dollars for fathers found in the 1860 Census. Row 12 gives the age the child would be in 1880. Row 13 is the percent of fathers who were initially assigned to the infantry. Row 14 is the percent whose initial rank was private. Row 15 is the percent whose prewar occupation was in the farm sector. The number of children in each group appears in row 16.

INDEPENDENT VARIABLE	1	2	3	4	5
	DEPENDENT VARIABLE				
	LOG OF SON'S IPUMS INCOME				LOG OF SON'S MARGO INCOME
	ALL FATHERS	FARMER/ PRIVATE FATHERS	ALL FATHERS		
F Died from Violence	**0.073** (0.037)	0.046 (0.055)	0.061 (0.038)	0.041 (0.040)	0.034 (0.025)
F Died from Illness				0.009 (0.028)	
F Died from Violence and M Remarried				0.166 (0.110)	
F Died from Illness and M Remarried				0.100 (0.072)	
F Total Disability Rating				-0.015 (0.048)	
F Grade 1 Disability Rating				0.034 (0.473)	
F Grade 2 Disability Rating				-0.161 (0.153)	
F Grade 3 Disability Rating				**-0.167** (0.095)	
F Log Prewar Income	**0.293** (0.031)				
Child Age in 1880	**0.063** (0.008)	**0.054** (0.012)	**0.063** (0.008)	**0.062** (0.008)	**0.052** (0.005)
Child Age in 1880 Squared	**-0.0009** (0.0001)	**-0.0006** (0.0002)	**-0.0009** (0.0001)	**-0.0009** (0.0001)	**-0.0006** (0.0001)
F Captain	**0.285** (0.118)		**0.283** (0.125)	**0.272** (0.125)	0.070 (0.084)
F Lieutenant	0.095 (0.105)		0.057 (0.109)	0.054 (0.111)	-0.012 (0.073)
F Sergeant	-0.083 (0.063)		-0.068 (0.064)	-0.069 (0.065)	0.027 (0.043)
F Corporal	-0.085 (0.058)		-0.079 (0.058)	-0.079 (0.059)	-0.044 (0.039)
F Private	**-0.083** (0.044)		**-0.094** (0.045)	**-0.099** (0.045)	-0.042 (0.030)
F 3-Digit Prewar IPUMS Occupational Dummies	NO		YES		
F Initial Company Dummies	YES				
N	3043	1478	3056	3056	3056

Figure 7: Effects of Father's Death on Son's Log Income in 1880 (OLS). Sample restricted to sons with paying jobs. Standard errors are corrected for clustering at the father level. Bold with underline indicates significance at the 5% level. Bold alone indicates significance at the 10% level.

are introduced. One way to do this is to restrict to a more homogeneous group. Nearly half of the sons had fathers who were farmers and were inducted as privates. We restrict to this group in column 2. Father's income is omitted since all fathers in this group are assigned the same income by our schema. Here the effect of father's violent death is now smaller and statistically insignificant.

In column 3, we use a different approach, which does not sacrifice sample size. The universe is again the set of all sons; however, father's log income is replaced by dummy variables for father's 3-digit occupation. Once again the effect of father's violent death is small and insignificant.

In column 5, instead of the log of the son's IPUMS income, here we use the log of the son's Margo income. We again find no effect of a father's violent death on a son's income in 1880.

Column 4 shows that these results are robust to the addition of some potentially important controls for the child's home environment after the war.[26] The effects of these new variables should be interpreted with caution as they may not represent random events. The first control is a dummy variable that equals 1 if the father died from illness during the war. The coefficient on this variable is close to zero and insignificant, implying that death from illness was also uncorrelated with a son's income. The second (respectively, third) new variable in column 4 is a dummy variable that equals 1 if the father died from violence (respectively, illness) during the war and the mother remarried.[27] These two variables let us study whether orphans whose mothers remarried

[26] We have also checked the effects of adding the other variables of Table 6: a dishonorable discharge dummy, a dummy for discharge due to disability, father's muster age, father's muster date, father's height at enlistment, father's prewar SEI, father's 1860 household assets per adult equivalent, and a dummy for father's being initially assigned to the infantry. These variables do not appreciably change the coefficient on father's violent death in any of our regressions. Results are available on request.

[27] Each remarried dummy equals 1 if and only if the father died from the given cause and the child's surname in 1880 matches the mother's surname from a subsequent marriage. We use this definition since the only information in IE about remarriage is the mother's new surname. The date of remarriage is not specified.

fared better than orphans who remained fatherless. The point estimates suggest that they did. This could be due to the increase in income that resulted from remarriage. However, the estimates are not significant and, moreover, a mother's remarriage might not have been a random event.

Finally, we add four disability variables.[28] These are based on disability ratings received by surviving fathers prior to 1880. During this period, positive disability ratings were given only for war-related disabilities (Linares [42]). The ratings were determined by army surgeons who examined the veterans.

There were four categories of disability. Grade 1, the most severe form of disability, was reserved for veterans who lost both eyes or both hands, or who required constant personal care:

> all persons ... who, while in the military or naval service and in line of duty, shall have lost the sight of both eyes, or who shall have lost both hands, or been permanently and totally disabled as to render them utterly helpless, or so nearly so as to require the constant personal aid and attendance of another person.... (Sanger [70, p. 56])

Grade-1 disabled veterans were granted a pension of $25 per month in 1866. This pension rose to $31.25 in 1872, $50 in 1874, and $72 in 1878. A pension of $50 equals the monthly wage of a white collar worker in 1860 and is about twice the wage of a manual laborer at that time (see Appendix B).

The second highest grade was grade 2. This grade was granted to veterans who lost both feet, or one hand and one foot, or who could perform no manual labor, but did not require constant care:

> all persons ... who, under like circumstance [i.e., during the war in the line of duty], shall have lost both feet, or one hand and one foot, or been totally and permanently disabled in the same, or otherwise so disabled as to

[28] These are derived from the Surgeons' Certificates records in the EI database (Fogel et al [22]). For a comprehensive history of the Civil War pension system, see Linares [42].

> be incapacitated for performing any manual labor, but not so much so as to require constant personal aid and attention (Sanger [70, p. 56])

The grade-2 disabled received a monthly pension of $20 in 1866. This was raised to $24 in 1872 and then remained at that level until 1883. This pension was about equivalent to the monthly wage of a manual laborer in 1860 (Appendix B).

The next grade, grade 3, applied to veterans who had lost a hand or a foot or the equivalent:

> all persons who, under like circumstances, shall have lost one hand or one foot, or been totally and permanently disabled in the same, or otherwise so disabled as to render their inability to perform manual labor equivalent to the loss of a hand or a foot (Sanger [70, p. 56])

These veterans received a pension of $15 per month in 1866. This was increased to $18 in 1872 and then remained constant until 1883. This pension was less than the monthly wage of a farm laborer in 1860, which was $21.55 (Appendix B).

Some veterans did not qualify for any of the three grades but were still impaired in their ability to perform manual labor. For instance, due to wartime wounds, a veteran might be unable to lift without great pain. These veterans were classified as Totally Disabled (Linares [42]).[29] Unlike graded disabilities, the pension for total disability depended on the highest rank attained. Captains were granted $20 per month; first lieutenants received $17; second lieutenants were paid $15; and all lower ranks were given $8 (Sanger [69, p. 567]). These rates remained constant over the period of our study (Linares [42]). These pensions were considerably less than the monthly wages they were designed to replace (Appendix B).

[29] The definitions of total disability and grade-2 disability appear similar, as both refer to an inability to perform manual labor. The difference appears to be that total disability refers only to hard physical labor while grade-2 disability was interpreted as an inability to do any work whatsoever. For instance, a veteran who could do no heavy lifting but who could work as a postal clerk would be assigned some fraction of total disability. A veteran whose condition did not permit him to work at any type of job would be classified as grade-2 disabled (Linares [42, n. 16]).

Beginning in 1870, it was permitted to assign fractional grades of total disability (Linares [42]). For instance, a surgeon might conclude that a veteran had lost half of his capacity for manual labor as a result of his war wounds. The surgeon would then assign a total disability rating of 0.5. This rating would entitle the veteran to $4 per month if he was a private, $7.5 if a 2nd lieutenant, and so on. Starting in 1872, a surgeon could also assign a fraction of the third grade to a veteran whose disability exceeded total disability but was less than equivalent to the loss of a hand or foot. This change allowed surgeons to grant pensions of $10, $12, $14, or $16 per month (Linares [42]).[30] Fractions of first and second grade disabilities were not permitted.

Some veterans were examined multiple times by surgeons prior to 1880. This was often in response to legal changes that established new, higher-paid categories of disability (Linares [42]). Another common reason was a decline in the recruit's physical condition. For instance, a recruit who had lost sight in one eye in the war might might lose sight in the other several years later. Upon certification by an army surgeon, this would qualify the veteran for a higher pension.

Our disability variables are defined as follows. grade-1 disability is a dummy variable that equals 1 if, prior to 1880, a veteran was ever deemed to be grade-1 disabled. Otherwise it is zero. grade-2 disability is defined analogously. Since grade 3 disability ratings were sometimes granted as fractions, a veteran's grade 3 disability variable equals the average of the grade-3 disability ratings he received prior to 1880. Similarly, a veteran's total disability rating is defined as the average of all total disability ratings he received prior to 1880. If a father never received a rating for a disability of a given type, then his rating for this type of disability was set to zero. Fathers who died in the war were assigned ratings of zero for all four types of disability.

The specification of column 4 in Table 7 includes these four disability variables. We detect no effect of a father's grade-1 disability or total disability on a son's income

[30] While total disability pensions depended on rank, grade 1, 2, and 3 pensions did not. Consequently, the new fractional grade-3 ratings were less helpful to higher ranked veterans. For instance, an upgrade from total disability to eight ninths of grade 3 would double a private's pension from $8 per month to $16 (8/9 of $18). It would not benefit a 1st lieutenant, who was already getting $17 per month.

in 1880. The coefficients on a father's grade-2 and grade-3 disability are similar in magnitude but only the latter is significant at the 10% level. The coefficient of -0.167 translates into a 15.4% drop in a son's income in 1880. Lee [39] finds disabled fathers accumulated less wealth after the war. This finding suggests that they also invested less in their children's human capital.[31] The noneffect of a father's grade-1 disability on a son's income has two potential explanations. First, the grade-1 pension far exceeded the lost income of the typical veteran. This may have allowed a veteran's family to maintain its investment in a child's human capital. Second, we will see below that a father's grade-1 disability made a son much more likely to be engaged in unpaid housework in 1880. A son with a lower market wage would have a lower opportunity cost of caring for his father. Thus, there may be a selection effect, since the sample in Table 7 is restricted to sons with paying jobs.

Table 8 displays analogous regressions for daughters. As in Table 7, only daughters with paying jobs in 1880 are included. The effect of father's violent death has a larger point estimate than that for sons, but remains insignificant at the 5% level. The negative coefficients on father's grade-2 and grade-3 disability suggest a negative effect on a daughter's income, as in the case of sons, but they are not statistically significant.

3.2 Effects on Work Status and Schooling

In this section we study the effects of father's violent death on the likelihood of his child having a paying job, being a student, or doing unpaid housework in 1880. Many daughters and a few sons have no recorded occupation in 1880. We classify these children as engaging in unpaid housework. There are two reasons for this. First, Census enumerators in 1880 were instructed not to record household chores as an occupation.[32]

[31] Parental investment in a child's human capital was first studied by Becker and Tomes [5].

[32] The relevant passage in the 1880 instructions for census enumerators is as follows.

> Women keeping house for their own families or for themselves, without any other gainful occupation, will be entered as "keeping house." Grown daughters assisting them will be reported without occupation. ... The inquiry as to occupation will not be asked

INDEPENDENT VARIABLE	1	2	3	4	5
	DEPENDENT VARIABLE:				
	LOG OF DAUGHTER'S IPUMS INCOME				LOG OF DAUGHTER'S MARGO INCOME
	ALL FATHERS	FARMER/ PRIVATE FATHERS	ALL FATHERS		
F Died from Violence	0.225 (0.165)	0.120 (0.281)	0.327 (0.185)	0.348 (0.227)	0.128 (0.075)
F Died from Illness				-0.130 (0.155)	
F Died from Violence and M Remarried				-0.516 (0.498)	
F Died from Illness and M Remarried				-0.301 (0.448)	
F Total Disability Rating				0.171 (0.320)	
F Grade 1 Disability Rating				0.000 .	
F Grade 2 Disability Rating				-0.654 (0.899)	
F Grade 3 Disability Rating				-0.471 (0.709)	
F Log Prewar Income	-0.130 (0.159)				
Child Age in 1880	0.030 (0.073)	0.328 (0.157)	0.030 (0.076)	0.040 (0.082)	0.014 (0.031)
Child Age in 1880 Squared	-0.0003 (0.0016)	-0.0068 (0.0035)	-0.0003 (0.0017)	-0.0005 (0.0018)	-0.0001 (0.0007)
F Captain	-0.843 (0.720)		-1.125 (0.780)	-1.128 (0.795)	**-0.680** (0.315)
F Lieutenant	-0.029 (0.673)		-0.031 (0.666)	-0.039 (0.684)	0.085 (0.269)
F Sergeant	0.288 (0.396)		0.070 (0.431)	-0.108 (0.474)	-0.022 (0.174)
F Corporal	0.397 (0.387)		0.336 (0.408)	0.304 (0.425)	0.113 (0.165)
F Private	-0.083 (0.344)		-0.065 (0.360)	-0.105 (0.382)	-0.095 (0.145)
F 3-Digit Prewar IPUMS Occupational Dummies	NO		YES		
F Initial Company Dummies	YES				
N	315	140	316	316	316

Figure 8: Effects of Father's Death on Daughter's Log Income in 1880 (OLS). Sample restricted to daughters with paying jobs. Standard errors are corrected for clustering at the father level. Bold with underline indicates significance at the 5% level. Bold alone indicates significance at the 10% level.

Second, the burden of housework was so great in the 19th century that any child who was not in school or working would have been regarded as a ready source of help at home.[33] Historical accounts support this notion: older children who lived at home were worked hard (Clifford [11, pp. 15-16]).

3.2.1 Effects on Working

Table 9 studies the effect of a father's violent death on his child's probability of having a paying job in 1880. Coefficients shown are marginal effects.[34] Columns 1-4 pertain to sons while results for daughters appear in columns 5-8. In this table and throughout the rest of the paper we retain the regressors of columns 1-4 in Table 7. Overall, 80.5% of sons and 16% of daughters had paying jobs in 1880 (Table 9, last row).

This table shows that a father's violent death has no effect on the likelihood that a child of either sex has a paying job in 1880. In column 4, we find that a father's death from illness is positively associated with a son having a paying job in 1880. This effect must be interpreted with caution due to the fact that death from illness was not a random event.

Column 8 shows that conditional on a father dying from illness, the widow's remarriage decreased the chance that her daughter had a paying job in 1880 by 1.9 percentage points. Negative coefficients of about the same magnitude are observed for the other three remarriage coefficients but are not statistically significant (columns 4 and 8). It may be that the positive income shock from remarriage made it less necessary for children

> in respect to infants or children too young to take any part in production. Neither will the doing of domestic errands or family chores out of school be considered an occupation. (IPUMS [51])

[33] The average household required 58 hours per week to maintain in 1900, compared to just 18 hours in 1975 (Greenwood, Seshadri, and Yorukoglu [27]).

[34] We use a probit specification. Each coefficient represents the marginal effect of a unit increase in the given variable on the probability that the child has a paying job in 1880, evaluated at the means of the other independent variables.

to get paying jobs.

Column 8 shows that conditional on the father surviving, having a grade-1 disability lowered his daughter's probably of having a paying job by 12.4 percentage points (significant at the 10% level). The corresponding coefficient for sons (column 4) is about the same but is insignificant. The grade-1 category consisted of veterans who could not function without constant personal aid. Veterans in this class also received very generous pensions (see above), so less outside income was needed to pay for the family's needs. A child in this situation would have had a strong incentive to stay at home to help care for his or her father.

3.2.2 Effects on Schooling

Table 10 studies the marginal effect of a father's death on a child's probability of being a student in 1880. The dependent variable equals 1 if the child is a student and zero if he has a paying job or is helping at home. There are too few students in 1880 for the estimations to converge with the specification of Table 9. For this reason, we used 23 dummy variables capturing father's state of enlistment instead of the 303 company dummies. There are also too few observations to restrict to farmer/private fathers, so this specification is omitted.

Columns 1-3 indicate that a father's death had no effect on a son's likelihood of being a student in 1880. However, we do find a negative effect on daughters in columns 4-6. In the specification of column 4, a father's violent death reduced a daughter's probability of being a student by 3.7 percentage points. The effect falls to 1.7 points in column 5, where father's income is replaced by father occupational dummies. In column 6, where home environment covariates are added, the effect falls to 1.3 percentage points but remains significant. We also find that a surviving father's grade-2 disability raised his son's chance of being a student in 1880 but had no effect on daughters. The other disability variables have no effects on either sons or daughters.

The coefficients on a father's death from illness and a widow's subsequent remarriage (column 6) imply a negative correlation between a father's death from illness and a daughter's chance of studying, but only if the mother remarried. Due to the endogeneity

INDEPENDENT VARIABLE	1	2	3	4	5	6	7	8
	PROBIT REGRESSION (MARGINAL EFFECTS)							
	DEPENDENT VARIABLE: 1 IF CHILD HAS PAYING JOB IN 1880; 0 OTHERWISE							
	SONS				DAUGHTERS			
	ALL FATHERS	FARMER/ PRIVATE FATHERS	ALL FATHERS		ALL FATHERS	FARMER/ PRIVATE FATHERS	ALL FATHERS	
F Died from Violence	-0.012 (0.018)	0.021 (0.027)	-0.008 (0.017)	0.002 (0.017)	0.001 (0.006)	0.004 (0.003)	0.001 (0.005)	0.004 (0.006)
F Died from Illness				**0.055** (0.015)				0.000 (0.004)
F Died from Violence and M Remarried				-0.028 (0.068)				-0.020 (0.015)
F Died from Illness and M Remarried				-0.030 (0.037)				**-0.019** (0.009)
F Total Disability Rating				0.002 (0.019)				0.007 (0.009)
F Grade 1 Disability Rating				-0.112 (0.281)				**-0.124** (0.027)
F Grade 2 Disability Rating				0.040 (0.043)				0.015 (0.030)
F Grade 3 Disability Rating				0.008 (0.041)				-0.011 (0.018)
F Log Prewar Income	0.003 (0.013)				0.001 (0.005)			
Child Age in 1880	**0.050** (0.003)	**0.040** (0.005)	**0.049** (0.003)	**0.046** (0.003)	**0.016** (0.005)	0.004 (0.003)	**0.013** (0.004)	**0.013** (0.004)
Child Age in 1880 Squared	**-0.0007** (0.00006)	**-0.0006** (0.00010)	**-0.0007** (0.00006)	**-0.0007** (0.00006)	**-0.0004** (0.0001)	-0.0001 (0.0001)	**-0.0003** (0.0001)	**-0.0003** (0.0001)
F 3-Digit Prewar IPUMS Occupational Dummies	NO		YES		NO		YES	
F Initial Company Dummies	YES							
F Initial Rank Dummies	YES							
N	3789	1882	3804	3804	1977	1023	1989	1989
Percent with Paying Job	80.4%	78.6%	80.5%	80.5%	16.1%	13.8%	16.0%	16.0%

Figure 9: Marginal Effect of Father's Death on Child's Probability of Having a Paying Job in 1880 (Probit). Dependent variable is 1 if child has paying job; 0 if student or doing unpaid housework. Coefficients are marginal effects. Standard errors of these marginal effects are in parentheses. Bold with underline indicates significance at the 5% level. Bold alone indicates significance at the 10% level. Intercept included.

INDEPENDENT VARIABLE	1	2	3	4	5	6
	PROBIT REGRESSION (MARGINAL EFFECTS)					
	DEPENDENT VARIABLE: 1 IF CHILD IS STUDENT IN 1880; 0 OTHERWISE					
	ALL FATHERS					
	SONS			DAUGHTERS		
F Died from Violence	-0.001 (0.008)	0.000 (0.005)	-0.004 (0.006)	**-0.037** (0.003)	**-0.018** (0.001)	**-0.013** (0.001)
F Died from Illness			-0.008 (0.005)			0.000 (0.001)
F Died from Violence and M Remarried			0.017 (0.014)			0.001 (0.001)
F Died from Illness and M Remarried			0.007 (0.013)			**-0.013** (0.003)
F Total Disability Rating			0.001 (0.004)			0.001 (0.001)
F Grade 1 Disability Rating			-0.004 (0.009)			0.001 (0.003)
F Grade 2 Disability Rating			**0.024** (0.009)			0.000 (0.002)
F Grade 3 Disability Rating			-0.010 (0.012)			-0.001 (0.002)
F Log Prewar Income	0.001 (0.004)			**0.004** (0.001)		
Child Age in 1880	**-0.013** (0.001)	**-0.010** (0.001)	**-0.009** (0.001)	0.000 (0.003)	0.001 (0.002)	0.001 (0.002)
Child Age in 1880 Squared	**0.0002** (0.00002)	**0.0001** (0.00002)	**0.0001** (0.00002)	-0.0001 (0.0001)	-0.0001 (0.0001)	-0.0001 (0.0001)
F 3-Digit Prewar IPUMS Occupational Dummies	NO	YES		NO	YES	
F's State of Initial Enlistment Dummies	YES					
F's Initial Rank Dummies	YES					
N	3771	3786	3786	1968	1980	1980
Percent Students	4.6%	4.7%	4.7%	9.7%	9.7%	9.7%

Figure 10: Marginal Effect of Father's Death on Child's Probability of Being a Student in 1880 (Probit). Dependent variable is 1 if child is a student; 0 if child has a paying job or is doing unpaid housework. Coefficients are marginal effects. Standard errors of these marginal effects are in parentheses. Bold with underline indicates significance at the 5% level. Bold alone indicates significance at the 10% level. Intercept included.

of death from illness and remarriage, this may not be a causal effect.

3.2.3 Effects on Unpaid Housework

In Table 11, we study the effects of a father's violent death on the likelihood that a child is engaged in unpaid housework in 1880. About 7% of sons and 53% of daughters were in this category (Table 11, last row). The effect on sons is estimated to be about zero. The point estimates for daughters suggest a positive effect but are insignificant at the 10% level. A positive effect would be consistent with findings from Tables 9 and 10. These tables show that a father's violent death caused a daughter to leave school but did not raise the likelihood of her having a paying job. A daughter who was not in school and did not have a paying job in 1880 is assumed to have been engaged in unpaid housework. However, the effect may be too small to detect in this sample.

The coefficients on grade-1 and 2 disability in columns 4 and 8 are of opposite signs.[35] They imply that a father's grade-1 disability raised the chance that his child was doing unpaid housework in 1880, while a less severe grade-2 disability lowered this chance. Grade-1 disabled veterans required constant attention and care, which might explain why their children were more likely to be helping out at home in 1880. Grade-2 disabled fathers required less care and some might have been able to help out with chores at home, freeing their children up to work or study. There may also be an income effect: grade-1 veterans received a much higher pension than grade-2 veterans.

3.3 Effects on Family Structure

We now consider the effects of a father's death on his child's family structure in 1880. We begin with the probability of being married (Table 12). About 28% of sons and 26% of daughters in our sample were married in 1880 (bottom row). We detect no effect of a father's violent death on a child's chance of being married. The small standard errors

[35] The point estimates for daughters are large in relation to the effects of a father's disability on a daughter having a paying job and being a student (Tables 9 and 10). However, the standard errors are very large as well.

INDEPENDENT VARIABLE	1	2	3	4	5	6	7	8
	PROBIT REGRESSION (MARGINAL EFFECTS)							
	DEPENDENT VARIABLE: 1 IF CHILD ENGAGED IN UNPAID HOUSEWORK IN 1880; 0 OTHERWISE							
	SONS				DAUGHTERS			
	ALL FATHERS	FARMER/ PRIVATE FATHERS	ALL FATHERS		ALL FATHERS	FARMER/ PRIVATE FATHERS	ALL FATHERS	
F Died from Violence	0.001 (0.001)	0.002 (0.003)	0.0005 (0.0003)	0.007 (0.006)	0.041 (0.059)	0.012 (0.091)	0.046 (0.062)	0.037 (0.069)
F Died from Illness				**-0.011** (0.006)				0.005 (0.051)
F Died from Violence and M Remarried				0.005 (0.024)				0.073 (0.148)
F Died from Illness and M Remarried				-0.001 (0.014)				0.078 (0.107)
F Total Disability Rating				-0.006 (0.008)				-0.075 (0.098)
F Grade 1 Disability Rating				**0.135** (0.033)				**0.718** (0.431)
F Grade 2 Disability Rating				**-0.053** (0.012)				**-0.791** (0.319)
F Grade 3 Disability Rating				0.006 (0.014)				0.128 (0.210)
F Log Prewar Income	0.000 (0.001)				-0.069 (0.053)			
Child Age in 1880	**-0.001** (0.000)	**-0.002** (0.001)	**-0.0005** (0.0001)	**-0.009** (0.002)	**0.052** (0.020)	**0.063** (0.028)	**0.055** (0.020)	**0.050** (0.021)
Child Age in 1880 Squared	**0.0000** 0.00000	0.0000 (0.00001)	**0.00001** (0.00000)	**0.0001** (0.00004)	-0.0003 (0.0005)	-0.0007 (0.0006)	-0.0004 (0.0005)	-0.0003 (0.0005)
F 3-Digit Prewar IPUMS Occupational Dummies	NO		YES		NO		YES	
F Initial Company Dummies	YES							
F Initial Rank Dummies	YES							
N	3771	1869	3786	3786	1968	1020	1980	1980
Percent doing Unpaid Housework	7.4%	8.1%	7.3%	7.3%	53.3%	56.5%	53.2%	53.2%

Figure 11: Marginal Effect of Father's Death on Child's Probability of Being Engaged in Unpaid Housework in 1880 (Probit). Dependent variable is 1 if child is doing unpaid housework; 0 if child has a paying job or is a student. Coefficients are marginal effects. Standard errors of these marginal effects are in parentheses. Bold with underline indicates significance at the 5% level. Bold alone indicates significance at the 10% level. Intercept included.

indicate that this effect is precisely estimated.

In contrast, a father's grade-1 disability lowered his son's chance of being married by 6.8 percentage points (column 4). The coefficients on the lower disability grades are insignificant. This implies that a father's disability caused his son to delay marriage, but only if the disability was severe enough to require constant personal care. While the effect on daughters is smaller, it exists also for less disabled fathers: both a father's grade-1 and grade-2 disability lowered a daughters' chance of being married by about 4 1/2 percentage points (column 8). This suggests that as a father became somewhat able to care for himself, it was acceptable for a son to marry but daughters were expected to stay home in order to care for the father's remaining needs.

Table 13 studies the effects of a father's death on the number of children his son or daughter has in 1880. The samples are restricted to married sons and daughters,[36] both of whom had about 1.6 children on average. Column 4 shows that a father's death raised his son's number of children by about one child per son, but only if the widowed mother remarried. This may be an income effect. Columns 5-8 shows quite different effects for daughters. A father's violent death caused his daughters who were married in 1880 to have 0.7 fewer children, in the specifications of columns 7 and 8. Effects are smaller and insignificant for daughters of farmer/private fathers (column 2). In contrast to sons, a widowed mother's remarriage has no effect on her daughter's number of children. The less severe disabilities (total and third grade) seem to have a positive effect on married children's fertility but these results are mixed. We detect no effect of the more severe grade-1 and grade-2 disabilities.

We also find effects on the likelihood that a child lived with his/her mother in 1880 (Table 14). The overall percentage of sons and daughters in the sample who lived with their mothers in 1880 was 53% and 60%, respectively (bottom row). A father's violent death lowered the probability that his son lived with his mother by 8 to 14 percentage points (columns 1-4). We find similar effects of a father's death from illness (column 4). A mother's remarriage appears to remedy this effect on her son, though statistically

[36] See footnote 11.

INDEPENDENT VARIABLE	1	2	3	4	5	6	7	8
	PROBIT REGRESSION (MARGINAL EFFECTS)							
	DEPENDENT VARIABLE: 1 IF CHILD MARRIED IN 1880; 0 OTHERWISE							
	SONS				DAUGHTERS			
	ALL FATHERS	FARMER/ PRIVATE FATHERS	ALL FATHERS		ALL FATHERS	FARMER/ PRIVATE FATHERS	ALL FATHERS	
F Died from Violence	-0.021 (0.020)	**-0.029** (0.017)	-0.020 (0.020)	-0.024 (0.018)	0.012 (0.013)	0.018 (0.020)	0.009 (0.011)	0.011 (0.022)
F Died from Illness				-0.012 (0.014)				0.022 (0.016)
F Died from Violence and M Remarried				0.035 (0.072)				0.131 (0.094)
F Died from Illness and M Remarried				-0.015 (0.045)				-0.027 (0.018)
F Total Disability Rating				-0.004 (0.027)				-0.023 (0.024)
F Grade 1 Disability Rating				**-0.068** (0.008)				**-0.043** (0.010)
F Grade 2 Disability Rating				-0.004 (0.074)				**-0.044** (0.006)
F Grade 3 Disability Rating				0.037 (0.062)				0.030 (0.049)
F Log Prewar Income	**-0.042** (0.018)				-0.001 (0.014)			
Child Age in 1880	**0.104** (0.006)	**0.063** (0.006)	**0.103** (0.006)	**0.102** (0.006)	**0.048** (0.005)	**0.051** (0.007)	**0.039** (0.004)	**0.062** (0.007)
Child Age in 1880 Squared	**-0.0014** (0.00011)	**-0.0009** (0.00010)	**-0.0014** (0.00011)	**-0.0014** (0.00011)	**-0.0007** (0.0001)	**-0.0007** (0.0001)	**-0.0005** (0.0001)	**-0.0008** (0.0001)
F 3-Digit Prewar IPUMS Occupational Dummies	NO		YES		NO		YES	
F Initial Company Dummies	YES							
F Initial Rank Dummies	YES							
N	3789	1882	3804	3804	1977	1023	1989	1989
Percent Married in 1880	27.9%	27.4%	27.9%	27.9%	25.8%	26.0%	25.7%	25.7%

Figure 12: Marginal Effect of Father's Death on Child's Probability of being Married in 1880 (Probit). Dependent variable is 1 if child is married, 0 otherwise. Coefficients are marginal effects. Standard errors of these marginal effects are in parentheses. Bold with underline indicates significance at the 5% level. Bold alone indicates significance at the 10% level. Intercept included.

INDEPENDENT VARIABLE	1	2	3	4	5	6	7	8
	DEPENDENT VARIABLE: NUMBER OF MARRIED SON'S CHILDREN (OLS)				DEPENDENT VARIABLE: NUMBER OF MARRIED DAUGHTER'S CHILDREN (OLS)			
	ALL FATHERS	FARMER/ PRIVATE FATHERS	ALL FATHERS		ALL FATHERS	FARMER/ PRIVATE FATHERS	ALL FATHERS	
F Died from Violence	0.168 (0.234)	0.405 (0.402)	0.171 (0.238)	0.187 (0.249)	**-0.482** (0.282)	-0.344 (0.462)	**-0.705** (0.295)	**-0.705** (0.334)
F Died from Illness				0.217 (0.158)				-0.229 (0.250)
F Died from Violence and M Remarried				**1.192** (0.608)				-0.166 (0.758)
F Died from Illness and M Remarried				**1.227** (0.497)				0.198 (0.488)
F Total Disability Rating				**0.677** (0.287)				0.012 (0.550)
F Grade 1 Disability Rating				0.000 .				0.000 .
F Grade 2 Disability Rating				-0.668 (0.866)				0.000 .
F Grade 3 Disability Rating				0.151 (0.539)				**2.037** (1.024)
F Log Prewar Income	-0.114 (0.200)				0.028 (0.332)			
Child Age in 1880	**0.174** (0.067)	0.047 (0.113)	**0.170** (0.068)	**0.175** (0.068)	**0.185** (0.100)	**0.332** (0.144)	0.152 (0.103)	0.159 (0.105)
Child Age in 1880 Squared	-0.0003 (0.00106)	0.0022 (0.00183)	-0.0003 (0.00108)	-0.0003 (0.00108)	-0.0012 (0.0018)	-0.0043 (0.0026)	-0.0005 (0.0018)	-0.0007 (0.0019)
F 3-Digit Prewar IPUMS Occupational Dummies	NO		YES		NO		YES	
F Initial Company Dummies	YES							
F Initial Rank Dummies	YES							
N	1056	516	1060	1060	511	266	512	512
Mean Number of Children	1.63	1.67	1.63	1.63	1.60	1.51	1.60	1.60

Figure 13: Effect of Father's Death on a Child's Number of Children in 1880, Conditional on the Child being Married in 1880 (OLS). Independent variable is child's number of own children. Standard errors in parentheses. Bold with underline indicates significance at the 5% level. Bold alone indicates significance at the 10% level. Intercept included.

these effects are less significant. In contrast, for daughters the effects of father's death and mother's remarriage are much smaller and generally insignificant (columns 5-8). A grade-1 disability (implying total helplessness) raised the chance that a son lived with his mother by 46 percentage points in 1880 (column 4). The effect on daughters was 30 percentage points. These large effects reflect the great burden of care that such fathers placed on their families, and may also be due to the generous pensions they received.[37]

Finally, we study the effects of a father's death on the number of siblings living with his child in 1880. This is divided into two parts. Table 15 shows the effects of a father's death on the number of siblings (of either gender) aged 18 and under living with the son or daughter in 1880. Columns 1-4 pertain to sons of the recruit while columns 5-8 pertain to daughters. The results imply that an orphan who lived with his mother in 1880 lived with about one fewer sibling aged 18 and under than a nonorphan who lived with his mother in 1880. This holds regardless of the father's cause of death. Remarriage remedied this effect, but only for sons whose fathers died violently. The effects of father's disability are mixed and mainly insignificant.

Table 16 shows the analogous regressions for the number of siblings aged 19 and over living with the child in 1880. Here we find a suggestion of a slight positive effect of father's violent death, although only the coefficient in column 4 is significant at the 5% level. The contrast with Table 15 suggests that the effects in that table are likely to be fertility effects: a surviving father was physically able to have more children after the war, while a dead father could not. The effects of father's disability are not significant at the 10% level.

4 Conclusions

The percentage of children living in female-headed families has risen considerably in recent decades. These children fare worse in school, work, and life. Most studies find that this is not entirely a causal effect. These range from simple studies that find a

[37] Bernheim, Shleifer, and Summers [6] find, similarly, that children are more likely to visit wealthy parents. For a contrary view, see Perozek [61].

INDEPENDENT VARIABLE	1	2	3	4	5	6	7	8
	PROBIT REGRESSION (MARGINAL EFFECTS)							
	DEPENDENT VARIABLE: 1 IF CHILD LIVES WITH MOTHER IN 1880; 0 OTHERWISE							
	SONS				DAUGHTERS			
	ALL FATHERS	FARMER/ PRIVATE FATHERS	ALL FATHERS		ALL FATHERS	FARMER/ PRIVATE FATHERS	ALL FATHERS	
F Died from Violence	**-0.084** (0.048)	-0.140 (0.086)	**-0.104** (0.051)	**-0.147** (0.054)	-0.028 (0.059)	0.010 (0.091)	-0.024 (0.061)	-0.039 (0.071)
F Died from Illness				**-0.143** (0.039)				-0.069 (0.047)
F Died from Violence and M Remarried				0.182 (0.133)				0.012 (0.146)
F Died from Illness and M Remarried				0.146 (0.089)				0.065 (0.094)
F Total Disability Rating				-0.014 (0.059)				0.074 (0.078)
F Grade 1 Disability Rating				**0.458** (0.033)				**0.300** (0.045)
F Grade 2 Disability Rating				-0.023 (0.178)				-0.353 (0.242)
F Grade 3 Disability Rating				0.055 (0.109)				0.049 (0.126)
F Log Prewar Income	0.047 (0.039)				0.003 (0.049)			
Child Age in 1880	**-0.122** (0.015)	**-0.120** (0.023)	**-0.126** (0.015)	**-0.124** (0.016)	**-0.118** (0.018)	**-0.130** (0.031)	**-0.119** (0.018)	**-0.115** (0.018)
Child Age in 1880 Squared	**0.0014** (0.00031)	**0.0012** (0.00047)	**0.0015** (0.00032)	**0.0014** (0.00033)	**0.0013** (0.0004)	**0.0016** (0.0007)	**0.0014** (0.0004)	**0.0013** (0.0004)
F 3-Digit Prewar IPUMS Occupational Dummies	NO		YES		NO		YES	
F Initial Company Dummies	YES							
F Initial Rank Dummies	YES							
N	3789	1882	3804	3804	1977	1023	1989	1989
Percent who Live with Mother	52.5%	52.5%	52.5%	52.5%	59.8%	58.8%	59.8%	59.8%

Figure 14: Marginal Effect of Father's Death on Child's Probability of Living with Mother in 1880 (Probit). Dependent variable is 1 if child lives with mother, 0 otherwise. Coefficients are marginal effects. Standard errors of these marginal effects are in parentheses. Bold with underline indicates significance at the 5% level. Bold alone indicates significance at the 10% level. Intercept included.

INDEPENDENT VARIABLE	1	2	3	4	5	6	7	8
	DEPENDENT VARIABLE: NUMBER OF SIBLINGS (OF EITHER GENDER) AGED 18 AND UNDER LIVING WITH CHILD IN 1880							
	UNIVERSE: ALL CHILDREN WHO LIVE WITH MOTHER AND ARE NOT HOUSEHOLD HEADS							
	SONS				DAUGHTERS			
	ALL FATHERS	FARMER/ PRIVATE FATHERS	ALL FATHERS		ALL FATHERS	FARMER/ PRIVATE FATHERS	ALL FATHERS	
F Died from Violence	**-0.915** (0.304)	**-1.212** (0.571)	**-0.981** (0.316)	**-1.625** (0.340)	**-0.861** (0.358)	**-0.959** (0.525)	**-0.894** (0.366)	**-1.078** (0.406)
F Died from Illness				**-1.192** (0.248)				**-1.110** (0.295)
F Died from Violence and M Remarried				**1.934** (0.804)				-0.136 (0.909)
F Died from Illness and M Remarried				-0.251 (0.585)				-0.185 (0.562)
F Total Disability Rating				**-0.798** (0.316)				-0.322 (0.448)
F Grade 1 Disability Rating				-0.526 (1.727)				-0.749 (1.428)
F Grade 2 Disability Rating				0.081 (1.042)				1.722 (1.677)
F Grade 3 Disability Rating				0.459 (0.665)				-0.052 (0.977)
F Log Prewar Income	**-0.545** (0.204)				-0.274 (0.262)			
Child Age in 1880	0.073 (0.070)	**0.258** (0.129)	0.079 (0.071)	**0.147** (0.071)	-0.074 (0.127)	0.085 (0.189)	-0.096 (0.129)	0.077 (0.131)
Child Age in 1880 Squared	**-0.0029** (0.00163)	**-0.0069** (0.00308)	**-0.0030** (0.00166)	**-0.0043** (0.00165)	-0.0001 (0.0031)	-0.0038 (0.0047)	0.0005 (0.0032)	-0.0033 (0.0032)
F 3-Digit Prewar IPUMS Occupational Dummies	NO		YES		NO		YES	
F Initial Company Dummies	YES							
F Initial Rank Dummies	YES							
N	1952	968	1959	1959	1171	596	1178	1178
Mean Number of Siblings Aged 18 and Under	2.96	3.13	2.96	2.96	3.02	3.15	3.02	3.02

Figure 15: Effect of Father's Death on Number of Siblings Aged 18 and Under Living with a Child in 1880, Conditional on the Child Living with his/her Mother and Not Being a Household Head (OLS). Independent variable is number of siblings (of either gender) aged 18 and under living with the child in 1880. Standard errors in parentheses. Bold with underline indicates significance at the 5% level. Bold alone indicates significance at the 10% level. Intercept included.

INDEPENDENT VARIABLE	1	2	3	4	5	6	7	8
	DEPENDENT VARIABLE: NUMBER OF SIBLINGS (OF EITHER GENDER) AGED 19 AND OVER LIVING WITH CHILD IN 1880							
	UNIVERSE: ALL CHILDREN WHO LIVE WITH MOTHER AND ARE NOT HOUSEHOLD HEADS							
	SONS				DAUGHTERS			
	ALL FATHERS	FARMER/ PRIVATE FATHERS	ALL FATHERS		ALL FATHERS	FARMER/ PRIVATE FATHERS	ALL FATHERS	
F Died from Violence	0.122 (0.118)	0.284 (0.215)	0.141 (0.123)	**0.420** (0.130)	0.182 (0.131)	0.153 (0.199)	0.175 (0.134)	0.170 (0.154)
F Died from Illness				**0.364** (0.094)				0.053 (0.113)
F Died from Violence and M Remarried				-0.395 (0.335)				-0.337 (0.349)
F Died from Illness and M Remarried				**-0.425** (0.226)				0.225 (0.220)
F Total Disability Rating				-0.141 (0.118)				-0.071 (0.169)
F Grade 1 Disability Rating				1.023 (0.621)				-0.317 (0.548)
F Grade 2 Disability Rating				-0.152 (0.410)				-0.482 (0.627)
F Grade 3 Disability Rating				0.344 (0.241)				0.009 (0.375)
F Log Prewar Income	-0.018 (0.078)				0.076 (0.093)			
Child Age in 1880	0.034 (0.031)	-0.029 (0.054)	0.027 (0.032)	-0.009 (0.031)	0.057 (0.053)	0.042 (0.079)	0.061 (0.054)	-0.040 (0.057)
Child Age in 1880 Squared	-0.0001 (0.00072)	0.0012 (0.00130)	0.0001 (0.00073)	0.0007 (0.00072)	-0.0004 (0.0013)	0.0002 (0.0020)	-0.0004 (0.0013)	0.0020 (0.0014)
F 3-Digit Prewar IPUMS Occupational Dummies	NO		YES		NO		YES	
F Initial Company Dummies	YES							
F Initial Rank Dummies	YES							
N	1952	968	1959	1959	1171	596	1178	1178
Mean Number of Siblings Aged 19 and Over	0.53	0.51	0.53	0.53	0.50	0.48	0.50	0.50

Figure 16: Effect of Father's Death on Number of Siblings Aged 19 and Over Living with a Child in 1880, Conditional on the Child Living with his/her Mother and Not Being a Household Head (OLS). Independent variable is number of siblings (of either gender) aged 19 and over living with the child in 1880. Standard errors in parentheses. Bold with underline indicates significance at the 5% level. Bold alone indicates significance at the 10% level. Intercept included.

smaller effect of family structure when other family variables are taken into account, to more sophisticated studies that use twins, parental death, or other devices to purge unobserved heterogeneity. But the question remains controversial: some methodologically sound studies do find support for a causal explanation.

A weakness of prior studies that have relied on parental death is that most deaths are not random. Those with less education have higher death rates, not only from disease but also from accidents, homicide, and suicide. This paper identifies a historical setting in which death was truly random. Both historical sources and our own analysis indicate that violent death in the U.S. Civil War was unrelated to any observable measure of a recruit's socioeconomic background. Hence, violent death in the Civil War can be used as a natural experiment to study the effects of father absence on children's outcomes.

4.1 Labor Market Effects

Our main result is that there is no evidence for a causal relationship between family structure and a child's labor market outcomes: a father's violent death has no effect on a child's income or chance of having a paying job as a young adult. We also find no effect on a son's probability of being a student. We do find a negative effect on a daughter's chance of studying. Finally, there is no effect on the chance of a child being engaged in unpaid housework.

In contrast, we find large effects of a parent's disability on these outcomes. Having a father with a grade-2 or -3 (intermediate) level of disability lowered a son's earnings, conditional on working. We found no effect on daughters' earnings, but our sample contains very few working daughters. We also find effects on work status: a daughter whose father had a grade-1 disability (requiring constant personal care) was much less likely to have a paying job in 1880.

A father's disability also affects the likelihood of doing unpaid housework. Having a father with a grade-1 disability made a son or daughter much more likely to be doing unpaid housework in 1880. These fathers imposed a high personal care burden on their families. They also received unusually generous pensions, which reduced the need for outside income. In contrast, children of fathers with grade-2 disabilities (severe but not

requiring constant personal care) were less likely to be helping out at home than children of able fathers. Pensions for grade-2 disabilities were substantially less generous than grade-1 pensions. This increased the need for outside income. Fathers with grade-2 disabilities also required less care and some may have been able to help with household chores.

4.2 Family Structure Effects

We also considered effects on family structure. A father's violent death has no effect on the chance that his son or daughter is married in 1880. A father's violent death also has no effect on a married son's number of children in 1880. However, it does lead a married daughter to have fewer children in 1880.

A father's violent death makes sons much less likely to live with their mothers in 1880. We detect no such effect on daughters. A father's death also leads children who live with their mothers to have about one fewer sibling aged 18 and under living in the same household. There is no effect on the number of siblings aged 19 and over living with the child. This appears to be a direct fertility effect: the father, being dead, could not have additional children.

A father's disability also affected his child's family structure. Having a father with a grade-1 disability (requiring constant personal care) made sons less likely to be married in 1880. The effect on daughters is slightly weaker than for sons but extends to grade-2 disability (the most severe disability that did not require constant personal care). The effects of a father's disability on a married child's fertility was mixed; there is a suggestion of a large positive effect for certain types of disability.

Having a father with a grade-1 disability made sons 45.8 percentage points more likely to live with their mothers in 1880. The effect on daughters was 30 percentage points. These effects are not present for less severe disabilities. Finally, a father's disability had no discernible effect on the number of older or younger siblings living with the child. However, our measures of disability are based on the loss of limbs or sight and inability to work. These injuries may not be highly correlated with impaired fertility.

A Other Data Sets

Before choosing to work with Civil War data, we checked two datasets that, at first glance, seemed likely to contain large numbers of fathers who fought in 20th century wars:

1. the 1972 Oxford Social Mobility Inquiry [29], a random sample of 10,309 British men born between 1908 and 1952;

2. the Wisconsin Longitudinal Study [31], a random sample of 10,317 men and women who graduated from Wisconsin high schools in 1957 (and thus were born around 1939).

The British data turned up very few men whose fathers died during the two world wars. Of the 1,604 men who were born from 1908 to 1914, only nine had fathers who died during World War I. Of the 1,553 men who were born from 1933 to 1939, only one had a father who died during World War II. These numbers are even smaller than the death rates that are observed after the wars. For example, 17 of the men born before World War I had fathers who died in the four years *after* that war.

Similar results were obtained from the Wisconsin dataset.[38] 127 of the subjects had fathers who died during the six years of World War II, while 156 of the subjects had fathers who died during the six years following World War II. Once again, the death rate during the war was lower than the rate after the war.

B The Civil War Pension System

The Civil War pension system is described by Linares [42]. Under the General Law of July 14, 1862, widows of enlisted men received $8 per month (Sanger [69, pp. 566-7]). Additional payments of $2 per month per child under 16, regardless of the dead soldier's rank, were added in 1866 (Sanger [70, p. 230]). An enlisted man's widow with 2.85 children (which is the average number of children of recruits in our sample in 1860)

[38] I am grateful to Robert Hauser for providing these numbers.

would thus have received $13.69 per month. Based on available evidence on caloric intake in the 19th century, a father in such a family would have consumed about 27% of the food in the family.[39] Assuming that this percentage also applies to other household spending, a pension that replaced 73% of the father's earnings would constitute full income insurance. Margo [45, Table 4.1] estimates that the average monthly wage of northern farm (nonfarm) laborers in 1860 was $21.55 ($27.99). Thus, a pension of $13.69 would have replaced 64% (49%) of the lost income of the typical widow of a northern farm (nonfarm) laborer.

The replacement rate is slightly lower for widows of white collar workers. Margo [45, Table 3A.12] finds average monthly wages for white collar workers of $49.59 in the Northeast. Their widows' pensions tended to be higher as well since white collar workers were disproportionately likely to enter the army as officers (Appendix D). The pension of an officer's widow was $20, $17, or $15 per month, depending on whether the deceased was a captain, 1st lieutenant, or 2nd lieutenant, respectively (Sanger [69, p. 567]). A 1st lieutenant's widow with 2.85 children would have received a monthly pension of $22.70, which is 46% of the monthly income of the typical white collar worker ($49.59).

C Income and Status Variables

Income data were not collected in the decennial Census until 1940. The Census Bureau asked for a respondent's occupation instead. Hence, we must map occupations into incomes. First, each occupational string found in our study is assigned a 3-digit occupational code from 1950 Census Bureau classification system [75].[40]

[39] This is based on caloric intake by age and sex in the 19th century, using the table from Fogel [19, p. 9].

[40] The North American Population Project (NAPP) has mapped each of about 1/2 million ASCII occupational descriptions found in the 1880 census to 1950 occupational codes. We use this map. We also manually coded a handful of occupational strings in both the 1860 Census and the Military Service Records that do not appear in the the 1880 Census and thus are not in the NAPP map.

The next step is to map these 3-digit occupational codes into incomes. We use two methods: an approach that was used by the Minnesota Data Center in the IPUMS project [50] and an alternative method based on research of Robert Margo [45].

The IPUMS method relies on median incomes by occupation and sex from a special report of the Census Bureau [76] derived from the 1950 Census. Using this report, each person in our study is assigned the median income in 1950 of persons sharing his/her 3-digit occupational code and sex. This departs slightly from the IPUMS approach, which is to assign the average of the male and female incomes.[41] These 1950 incomes are then scaled to 2003 dollars using the increase in the consumer price index. The IPUMS method has the advantage that distinct incomes are available for all 280 3-digit occupational categories. Its drawback is that relative incomes may have changed from 1860 to 1950.

The second method uses 1860 wages for nine broadly defined occupations from Margo [45]. These annual wages, inflated to 2003 dollars, appear in Table 17. Here a person's income depends on his or her 1-digit 1950 occupational code, with exceptions noted in the table. The advantage of this method is that it is based on actual 1860 wages. Its disadvantage is its small number of categories, which necessitate a considerable loss of detail.

Our study also uses information on socioeconomic status. We use the map from 1950 occupation to socioeconomic status (SEI) that is provided by IPUMS. The construction of this map is explained in the IPUMS-USA data dictionary:

> The SEI, which is based on the 1950 occupational classification system, is a measure of occupational status based upon the income level and educational attainment associated with each occupation in 1950. The score was derived by using median income and education levels for men in 1950 to predict prestige assessments from a 1947 survey (of a select group of occupations).

[41] The Census report omits median incomes for women in some occupations 1950 due to insufficient numbers. For these occupations, we impute a woman's income as the median income of males in the given occupation, multiplied by the ratio of the average female income to the average male income for those occupations for which both male and female median incomes are reported.

1950 Census Occupation Code	Occupational Group	Margo Income	
		1860 Dollars	2003 Dollars
0-99	Professional/Technical	$1,067	$21,587
100-199 and 810	Farm Owners/Managers/Foremen	$524	$10,609
200-299	Manager/Official/Proprietor	$1,067	$21,587
300-399	Clerical	$652	$13,195
400-499	Sales	$652	$13,195
500-599	Crafts	$535	$10,836
600-615	Apprentices	$345	$6,987
620-699	Operatives	$535	$10,836
700-799	Service	$629	$12,731
820-840	Farm Workers	$273	$5,533
910-970	Nonfarm Laborers	$328	$6,640
975	Occupation Unknown	Missing	Missing
980-995	No Occupation	$0	$0

Figure 17: Occupational categories from Margo [45] and their annualized wages in 1860 and 2003 dollars.

> The resulting statistical model was used to generate scores for the entire range of 1950 occupations. See O. D. Duncan, "A Socioeconomic Index for All Occupations," in A. Reiss et al., Occupations and Social Status (Free Press, 1961). (Minnesota Data Center [52])

D Determinants of Initial Rank

This section presents evidence on the relation between socioeconomic background and initial rank. Table 18 presents characteristics of recruits broken down by initial rank.[42] Men who were older, taller, of higher income and wealth, and of higher status were assigned to higher initial ranks. The top ranks tended to be professionals, manager/proprietors, or skilled manual workers (crafts). The middle ranks were disproportionately semiskilled manual workers (operatives) while the lower ranks were disproportionately farmers and unskilled nonfarm workers before the war. The determinants of initial rank were previously studied by Lee [37], who reached similar conclusions.

[42] The ranks in descending order in the IE database are captain, lieutenant, sergeant, corporal, and private. Miscellaneous is a catch-all category that includes cooks, teamsters, musicians, and so on.

Characteristic	Captain	Lieutenant	Sergeant	Corporal	Private	Misc.
Muster Age	32.5	29.5	27.8	26.3	25.6	25.1
Age-Adjusted Height	1.019	1.020	1.014	1.011	0.999	0.995
IPUMS Income (2003 $000)	$25.6	$20.9	$17.6	$15.6	$14.8	$15.7
Margo Income (2003 $000)	$8.8	$8.2	$7.7	$7.4	$7.1	$7.1
Hhld Assets per Adult Equiv. (2003 $000)	$14.3	$18.7	$11.2	$12.5	$8.9	$8.8
Socioeconomic Index	44.6	34.8	24.5	19.6	16.8	18.6
Occupational Distribution						
Professional	22.8%	15.2%	6.4%	3.4%	1.7%	3.7%
Manager/Proprietor	22.8%	9.1%	3.2%	1.0%	0.7%	1.4%
Craft	22.8%	23.5%	25.3%	24.0%	17.2%	20.2%
Farmer	17.5%	28.8%	36.8%	47.0%	50.5%	41.0%
Operative	1.8%	6.8%	11.9%	11.1%	9.5%	10.5%
Nonfarm Laborer	3.5%	3.0%	5.4%	6.7%	16.2%	16.9%
N	59	134	794	1263	31202	2118

Figure 18: Characteristics of Recruit by Initial Rank.

E Reliability of Matching Algorithm

Section 2.3 presents our main matching algorithm, which uses only information about the child we seek. We will call this the "Child Approach". In this appendix we present evidence that the Child Approach is right at least about 88% of the time. This evidence comes from comparing results of the Child Approach to results from an a different matching algorithm, the "Household Approach".

The Household Approach uses information about other household members in order to identify the child. We treat a child found in 1880 as a match if (a) his/her name, birthplace, and birthyear (± 1 year) match and (b) the household contains at least one other person who lived with the child in 1860/70 census or who is mentioned as a family member in the EI pension records. These other household members are also identified using the same method as the child: name, birthplace, and birth year ± 1. To avoid making this approach too stringent, we drop two requirements.[43] First, we no longer use the Spedis algorithm to match the spelling of the last names. (We still use the Double Metaphone algorithm to ensure a phonetic match.) Spellings in the 19th

[43] These requirements are dropped for both the child and the child's household members.

century were far from standardized and, as a result, gross misspellings by Census takers were common. Second, we drop the requirement that the mother's birth place matches. A close inspection of Census records in 1880 indicates that children are often confused about where their mother was born. We found many cases in which the birth place a child reports in 1880 for her mother is different from what her mother said in 1860 or 1870. Often the child believed erroneously that her mother was born where the child or the mother grew up.

The results of the Household Approach are as follows: 26% of girls and 25% of boys were matched uniquely; only 3% of girls and 3% of boys were matched with duplication; and 71% of girls and 72% of boys were not located in 1880. The main difference from the Child Approach is that there are fewer multiple matches and more nonmatches. The percentage of unique matches is about the same under the two approaches.

Statistics for matched and unmatched children appear in Table 19. The proportion of children whose fathers died is much lower for children who are successfully matched. This is partly because fathers are used to match children; hence, those whose fathers died were less likely to be found in 1880. A more serious problem is that the Household Approach is biased towards finding children who have not yet left home. Accordingly, matched children are much (4 to 5 years) younger than unmatched children. In addition, leaving home may be correlated with labor market success. Because of these findings, we cannot use the Household Approach to study the effects of father absence on either work outcomes or family structure.

While the Household Approach cannot be used to study the questions of interest, it can be used to check how often the Child Approach yields false matches. To see how, let us first restrict to the set of children who are matched uniquely by both approaches. There are 2,398 children in this category. For 2,116 (88.2%) of these children, the two approaches agree: they identify the same person in 1880. We can safely assume that the Child Approach is right in these cases, since it is confirmed by the Household Approach. In 282 (11.8%) of the cases, the two approaches disagree: they identify two different people in 1880. For these cases, the worst assumption for the Child Approach is that it's always wrong. But even with this worst-case assumption, the Child Approach is

	Characteristic	SONS		DAUGHTERS	
		Matched	Unmatched	Matched	Unmatched
1	F Dishonorably Discharged	0.14%	0.47%	0.11%	0.41%
2	F Discharged due to Disability	18.0%	19.2%	16.9%	18.0%
3	F Died in War from Illness	8.1%	15.0%	8.1%	14.0%
4	F Died Violently in War	4.5%	6.6%	5.2%	6.9%
5	F Muster Age	32.2	34.8	30.9	34.7
6	F Muster Date	1863.5	1863.3	1863.6	1863.3
7	F Enlistment Term	2.36	2.51	2.27	2.50
8	F Height at Enlistment	68.3	68.3	68.2	68.2
9	F Prewar Inc. (2003 Dollars)	$14,598	$14,805	$14,638	$14,788
10	F Prewar SEI	16.9	17.0	17.2	17.0
11	F 1860 HH Assets Per Adult Equiv (2003 Dollars)	$5,788	$4,868	$6,371	$4,908
12	Child Age in 1880	20.0	23.8	18.4	23.6
13	F Initially Infantry	93%	94%	94%	93%
14	F Initial Rank is Private	86%	87%	87%	87%
15	F Farm Sector Before War	56%	55%	57%	56%
16	N	2953	9088	1824	10076

Figure 19: Household Approach: Characteristics of Matched and Unmatched Children. Unmatched daughters include those who are excluded from the matching procedure because they lack pension records. Variables are defined in Table 6.

right 2116/2398 = 88.2% of the time for these children (those for whom both approaches yield unique matches).

Now consider those children for whom the Child Approach yields a unique match but the Household Approach does not. Is the Child Approach right at least around 88% for these children as well? It should be. For nearly all of these children, the Household Approach must yield no matches, since it very rarely yields multiple matches. Why doesn't the Household Approach yield a match in these cases? It can't be because the child's own information doesn't match: the Household Approach imposes less stringent requirements on this information than the Child Approach does — and by assumption, the Child Approach yields a unique match. Rather, it must be because in 1880 the child is not living with anyone listed as a household member in the source data (the 1860/70 Census and the pension records). So the 88% extrapolates if the chance of a false match under the Child Approach is independent of the presence or absence of other household members in 1880. This seems likely: the false matches of the Child Approach are due to having common names, which would seem to be unrelated to the presence of other household members.

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