Brothers in Arms

Spillovers from a Draft Lottery

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ABSTRACT

While family members tend to have similar labor market outcomes, measuring the contribution of behavioral spillovers is difficult. To identify spillovers between brothers, we exploit Denmark's largest random assignment of young men—to eight months of military service, where service status of brothers is correlated, but draft lottery numbers are not. We find average spillovers of elder brother service on younger brother service of 7 percent, and as high as 55 percent for closely spaced brothers without sisters. Elder brother's military service affects his own occupational choice and his younger brother's service by discouraging any refusal to serve.

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I. Introduction

Family members tend to behave similarly, due to correlations of resources, constraints and preferences, and regular interactions with one another.[1] Siblings can, for example, set behavior norms that are costly to deviate from, or they can provide information on the costs and benefits of various actions that inform one another's decisions. Such spillovers in behavior between siblings are relevant for policy evaluation because they may reinforce or dampen the effects of individual interventions. However, very little evidence exists on the spillover effects of programs within families.

In this work we measure spillovers between brothers' participation in a large-scale program—military service in Denmark.[2] Conscription was reintroduced in Denmark after World War II, and every male, upon turning 18, is assessed for suitability for the armed forces. Of those who are fit for service, 44 percent are randomly assigned to eight months of military service, and 21 percent volunteer even though they have not been randomly assigned to serve.[3] As the administrative registers allow us to link brothers, we are able to study how brothers influence one another when it comes to participating in the military. Our paper is the first to study sibling spillovers in military service and the first to study sibling spillovers in program participation by random assignment.

In terms of interventions, military conscription is one of the world's most comprehensive programs. Conscription exists in many countries worldwide, even though most are not involved in an armed conflict, and service duration ranges from several months to several years.[4] In the first study to use draft lottery randomization, Hearst, Newman, and Hulley (1986) show the health costs of military service during wartime. Peacetime service involves the risk of deployment if conflict occurs or if peace-keeping is required.[5] In times of peace, there is evidence that the opportunity cost of military service in terms of earnings is substantial.[6] This is particularly true in Denmark, where Bingley, Lundborg, and Vincent Lyk-Jensen (2020), using the same data as this paper, find mean earnings losses of 2.5 percent in the age range 25–35. While most studies have focused on the costs of military service, some evidence suggests that certain types of military training might increase social skills (Grönqvist and Lindqvist 2016). The decision to join the military is therefore not trivial, and causal evidence of sibling spillovers would

1. For recent overviews of the importance of family background for economic outcomes in later life, see Black and Devereux (2011); Björklund and Salvanes (2010), and Holmlund, Lindahl, and Plug (2011).

2. Numerous studies have shown that military service often appears to "run in the family." See Johnson and Lidow (2016) for a recent overview.

3. Volunteering for Danish military service was first allowed in 1973. Percentages drafted and volunteering refer to birth cohorts 1976–1983.

4. See *The World Factbook 2017* (Central Intelligence Agency 2017).

5. During our sample period, the Danish military deployed soldiers to Afghanistan, the Balkans and Iraq. However, draftees were not deployed unless they volunteered for these missions. In our sample, 4 percent volunteer to do so.

6. For studies on the cost of wartime conscription in terms of labor, educational, and health outcomes, see Hearst, Newman, and Hulley (1986); Angrist (1990); Angrist and Krueger (1994); Bedard and Deschenes (2006); Dobkin and Shabani (2009); Angrist, Chen, and Frandsen (2010); Angrist, Chen, and Song (2011); Angrist and Chen (2011); and Autor, Duggan, and Lyle (2011). For evidence on the effect of peacetime conscription, see Imbens and van der Klaauw (1995); Grenet, Hart, and Roberts (2011); Bauer et al. (2012); Galiani, Rossi, and Schargrodsky (2011); Card and Cardoso (2012); and Albæk et al. (2017).

suggest an important behavioral role of the family in military recruitment in particular and in spreading the effects of program participation in general.

A key challenge in estimating sibling spillovers is that family members share relevant but unobserved background characteristics, making disentangling spillover effects from the influences of other shared factors difficult.[7] The Danish institutional framework provides us with a unique opportunity for overcoming the difficulties in estimating sibling spillovers. As the Danish Armed Forces use a lottery to assign fit-for-service men to military service, and as the assignment of brothers is independent, we can identify the behavioral spillover effect by exploiting the random assignment of brothers to military service. Moreover, the timing of the draft lottery means that the influence can run only from an elder brother to a younger one, a condition that allows us to resolve the reflection problem, where peers both affect and are affected by one another (Manski 2000). By exploiting the lottery, we can thus credibly estimate the causal effect of having an elder brother serving in the military on the younger brother's probability of also doing so.

Our results show strong evidence of sibling spillovers in military service. The lottery is a powerful determinant of participation in the military, and we find that having an elder brother serving increases a younger brother's service probability by three percentage points. This finding corresponds to a 7 percent increase in service probability at the mean. Due to our instrumental variables design, this effect reflects a younger brother's response to having an elder brother who is forced to serve because of the lottery outcome but who otherwise would not have chosen to serve.

Moreover, the strength of spillovers depends on family composition. Our results extend to a sample of three brothers, with spillovers that are six times larger than for the first two brothers in general. By looking for heterogeneity in responses, we explore a number of possible channels through which effects might operate. Our results suggest that spillovers are greater among closely spaced brothers, who can be expected to interact more frequently.

We avoid several threats to identification. As the random assignment is made after the recruitment tests have taken place, we can use test results to check for balanced random assignment. Using an extensive set of predetermined variables, we show that none of them can predict assignment by the lottery. We also show that the lottery numbers are uncorrelated across brothers. Moreover, we find no effect of elder brother service on younger brother height or Armed Forces Qualification Test (AFQT) score outcomes that should be immune to spillovers.

Furthermore, when we use the younger brother's lottery outcome as an instrument for younger brother service, in a reverse-regression placebo, we show that no effect runs from a younger brother to an elder brother. To test for spillovers outside the family, we also match placebo brother pairs according to membership of groups through which influence might be transferred. Our findings confirm that the spillovers operate inside, not outside, the family.

Our paper is related to a small but growing literature that exploits natural experiments to estimate family spillovers, and we combine insights from several studies to make our

7. See Manski (1993) for a classic overview of the methodological issues involved in the estimation of peer effects. More recent discussions appear in Manski (2000), Moffitt (2001), and Angrist (2014).

unique contribution about sibling spillovers in military service by way of random assignment.[8] While Campante and Yanagizawa-Drott (2015) is the only other study analyzing spillovers in military service, they consider U.S. wartime experience of fathers and sons, not brothers. They use father's age at the time of war as an instrument for his service probability, and find a ten percentage point spillover in service probability (88 percent at the mean).[9] Dahl, Kostøl, and Mogstad (2014) also analyze parent–child spillovers, but in disability insurance program participation in Norway. Using random assignment to appeal to judges of different stringency as an instrument for parent's disability insurance award probability, they find a 12 percentage point spillover in the ten-year award probability (145 percent at the mean).[10] As Campante and Yanagizawa-Drott (2015), we study military service, although in peacetime, and as Dahl, Kostøl, and Mogstad (2014), we use random assignment for identification. However, while both these studies estimate parent–offspring spillovers, we study sibling spillovers. Other studies of sibling spillovers have not looked at military service or used random assignment.[11] Dahl, Loken, and Mogstad (2014) study spillovers between brothers in paternity leave program participation in Norway. Using a regression discontinuity design based on the child's date of birth, they find a 15 percentage point spillover in paternity leave takeup (27 percent at the mean).[12] Qureshi (2018a) studies sister–brother spillovers in school attendance in Pakistan. Using distance to a girl's school as an instrument for elder sister years of schooling, she finds a spillover to younger brother years of schooling of 19 percentage points (6 percent at the mean).[13,14] We are the first to use random assignment, rather than quasi-randomness, to identify sibling spillovers.

We make three distinct contributions to the literature. First, we estimate sibling spillovers in military service. Second, and even more importantly, we use random assignment

8. Another strand of the literature uses randomization to estimate peer effects and social network effects in other contexts. See Ludwig, Duncan, and Hirschfield (2001); Kling, Liebman, and Katz (2007); and Kuhn et al. (2011) for neighbors. See Sacerdote (2001); Cullen, Jacob, and Levitt (2006); Carrell, Sacerdote, and West (2013); and Lalive and Cattaneo (2009) for classmates. See Duflo and Saez (2003) and Bandiera, Barankay, and Rasul (2010) for coworkers. See Angelucci et al. (2010) for extended family networks.

9. Estimates are from Campante and Yanagizawa-Drott (2015, p. 45, Table 3, Column 7).

10. Estimates are from Dahl, Kostøl, and Mogstad (2014, p. 1732, Table 3, Column 5).

11. A few studies have examined other types of sibling spillovers. Monstad, Propper, and Salvanes (2011) study sibling spillovers in teen motherhood, using an educational reform that impacted on the elder sister's teenage fertility as an instrument. Their results suggest that teen births tend to spill over within families and that the effect is larger when siblings are close in age. By matching families of teenagers on prior test score trajectories, Heissel (2017) finds spillovers from teenage motherhood to reduced teen sibling test scores, schooling, and increased criminality. Breining et al. (2015) show that having a sibling exposed to an early life health intervention, based on birth weight thresholds, positively affects another sibling's educational outcomes. Black et al. (2017) study spillovers from a younger sibling with a disability affecting elder sibling test scores. Landersø, Nielsen, and Simonsen (2020), using a regression-discontinuity design, find that school starting age of a younger sibling has a positive effect on test scores for an elder sibling.

12. Estimates are from Dahl, Loken, and Mogstad (2014, p. 2060, Table 1, Column 3).

13. Estimates are from Qureshi (2018a, p. 20, Table 6, Column 5).

14. Joensen and Nielsen (2018) study sibling spillovers in course choices in high school, by using a curriculum reform changing the cost of taking advanced math and science courses for the elder siblings as an instrument for his or her course choice. They find spillovers in math–science probability of three to four percentage points, although these are insignificant for the sample as a whole. Qureshi (2018b) studies spillovers in reading achievement from elder to younger siblings, using teacher experience as an instrument for elder sibling achievement. Other recent papers studying sibling spillovers in educational outcomes include Dustan (2018) and Karbownik and Özek (2018).

to identify sibling spillovers. The use of random assignment improves on the literature on sibling spillovers in terms of both internal and external validity. The randomization means that, compared to papers using quasi-experimental designs, our estimates rely on weaker assumptions and are arguably identified in the cleanest possible way. Moreover, while the few regression-discontinuity design papers estimating spillover effects produce convincing causal estimates, these estimates are often less generalizable, as they are identified only for individuals close to the cutoffs. A lottery such as the Danish one randomizes the full population of (fit-for-service) men to service, thereby increasing external validity. Third, because brothers are independently randomly assigned, we are able to identify the behavioral mechanisms driving brother responses.

Taken together, our results have several important implications, for military recruitment in particular, and for program participation and interpretation of sibling correlations in general. The literature on military service has focused mainly on the effect of service on subsequent health and earnings. Much less is known about the determinants of serving, and our results suggest that the common observation that military experience runs in the family partly reflects the influence that family members have on one another, rather than simply reflecting shared background. This result is valuable for nations wishing to maintain or expand the size of their armed forces.

While the advantages of military conscription as opposed to an all-volunteer force have long been debated,[15] one advantage of the mixed recruitment of conscripts and volunteers is that more spillovers of different kinds become possible for more people. In contrast to an all-volunteer force, conscription broadens the population basis for military recruitment, and we show that under a mixed conscription and volunteer force, behavioral spillovers between brothers further broaden the recruitment base.

For program participation more generally, we show the importance of the family in a context where information about the program is widely available. Dahl, Kostøl, and Mogstad (2014) have shown the importance of families in a context where information about a disability insurance program is scarce. In contrast, because military service is a much larger program, with a full male cohort that may be called to serve, we would expect a great deal of information to be publicly available. Nevertheless, families can still significantly affect behavior.

Finally, our results speak to the large literature on sibling correlations by showing that an important part of these correlations may reflect spillover effects across siblings. This explanation complements the traditional explanation that sibling correlations are taken as a measure of the combined effects of family background and community influences on a particular outcome. This finding complicates the interpretation of differences in sibling correlations across contexts, as differences could arise even in situations where the family and community influences are the same but where the social influences are different. Furthermore, this finding complicates the interpretation of empirical work using sibling fixed effects, for example, twin studies.

The rest of the paper is organized as follows. Section II describes the institutional context in Denmark and the details of the draft lottery. Section III presents our empirical approach, and Section IV describes the data. Section V presents the results, and Section VI concludes.

15. See Gates et al. (1970).

II. Military Service in Denmark

On their 18th birthday all male Danish citizens resident in Denmark are called to attend an Armed Forces Day (AFD), which takes place three to nine months later.[16] As the call is mandatory, refusal to attend this recruitment event results in a fine or imprisonment. Denmark holds 200 AFDs throughout the year, and at each of the six regional military recruitment centers, 40–50 men are assessed over five to six hours. Men found to be fit for service are randomly assigned to military service through a lottery held at the end of the AFD.[17]

We illustrate the military conscription procedure in Figure 1. Before participating in the AFD, all prospective draftees submit a health questionnaire for use as background information for the assessment. From both responses to this questionnaire and supporting documentation, about 10 percent of a cohort is declared unfit for military service and therefore ineligible for the draft. Reasons for ineligibility are serious somatic or psychiatric disorders, which need to be certified by a consultant physician at a regional public hospital (Hageman, Pinborg, and Andersen 2008).

On the AFD, prospective draftees undergo a fitness assessment consisting of a medical examination, a psychological evaluation, and an AFQT.[18] Because of low AFQT scores (10 percent), high body mass index (10 percent), low body mass index (5 percent), or certain medical conditions (the top three being ADHD, musculoskeletal disorders, and asthma, each at 1 percent), 30 percent of AFD participants, or 27 percent of a cohort, are declared ineligible. Thus, about 70 percent of those participating on the AFD (63 percent of each cohort) are declared fit for military service and are assigned a future date at which they may be required to serve (service begins every six months). Finally, at the end of the AFD, all fit-for-service men must draw a lottery number from a drum.[19]

After the AFD, any man declared fit for service can volunteer, and he will serve from his pre-assigned service date. Each February and August, the Ministry of Defense announces a lottery number threshold (AFD's half-year thresholds) based on the personnel needs of the military over the next 7–12 months, depending on the number of volunteers and subject to the distribution of potential service dates. All men are assigned to serve if (i) they have potential service dates within the upcoming 7–12

16. Since 2004, women have been invited to participate in the AFD. However, they are not required to attend, nor do they draw a lottery number. Therefore, our analyses include only men.

17. A number of European countries have abolished conscription in recent years. For an overview of conscription worldwide, see *The World Factbook 2017* (Central Intelligence Agency 2017). However, the Danish military comprises men recruited through the conscription process and all-volunteer deployable forces. Denmark deploys soldiers for international missions with the UN, NATO, and coalition forces. For example, Denmark contributed the most soldiers per capita to the NATO-led security mission in Afghanistan and Denmark has had the highest count of casualties per capita (https://shape.nato.int/denmark, accessed March 16, 2020). Since 1992 Denmark has deployed 37,000 soldiers in Afghanistan, Iraq, and the Balkans.

18. The test has been in use since 1957, has 78 items, and the total test score is the number of correct answers (Teasdale 2009). Angrist (1993) documents the history of the U.S. AFQT, showing that eight versions have been used between 1950 and 1973. In the Vietnam era the U.S. AFQT contained three subtests: arithmetic reasoning, word knowledge, and pattern analysis (Maier and Fuchs 1974). The Danish AFQT contains four subtests: letter matrices, verbal analogies, number series, and geometric figures (Teasdale and Owen 2000), While there is no direct comparison of the U.S. and Danish AFQTs, they are both correlated 0.8 with the Wechsler Adult Intelligence Scale (Mortensen, Reinisch, and Teasdale 1989; McGrevy, Knouse, and Thompson 1974) .

19. In contrast to conscription in some countries, for example, the Netherlands, no exemption is granted for a younger brother if an elder brother has previously served (Van Schellen, Apel, and Nieuwbeerta 2012).

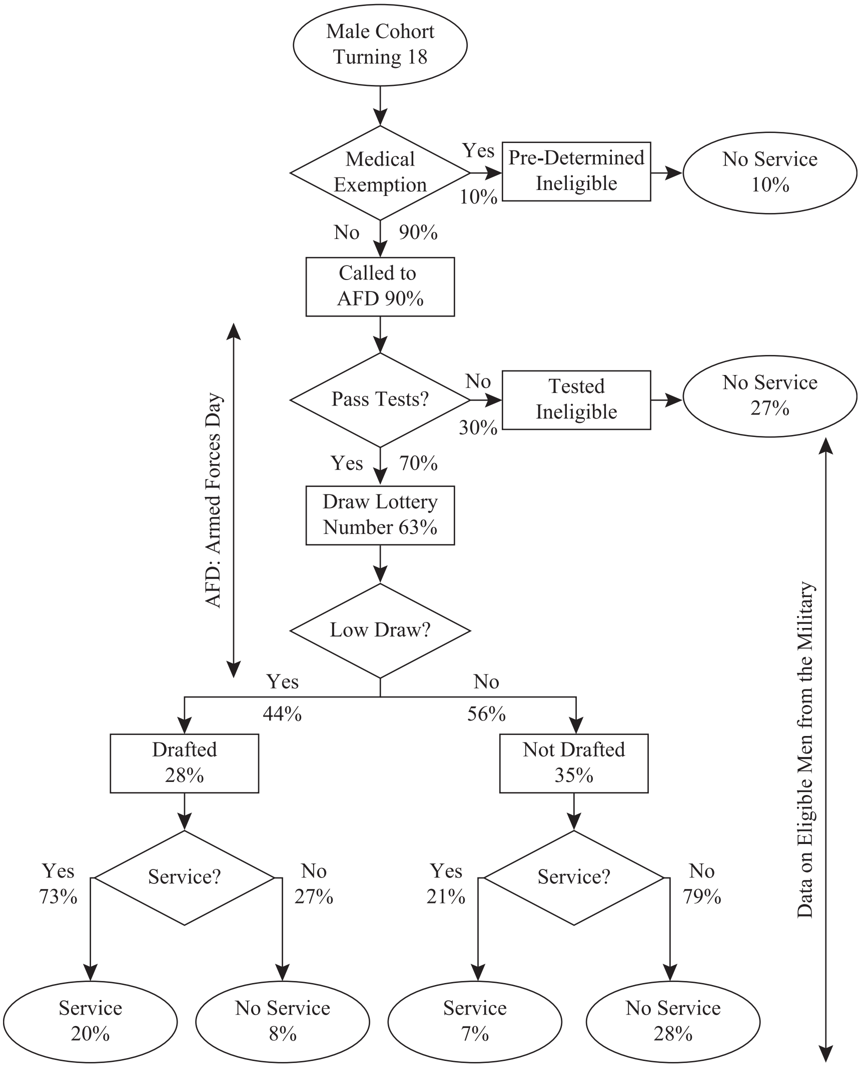

Figure 1

Flow Chart of the Conscription Process

Notes: Numbers inside the shapes denote average percentages of our birth cohorts 1976–1983. Numbers beside the arrows denote average percentages taking each route conditional on reaching the junction. The AFD includes test taking and drawing lottery numbers. Our estimation data set contains information on all those who drew a lottery number.

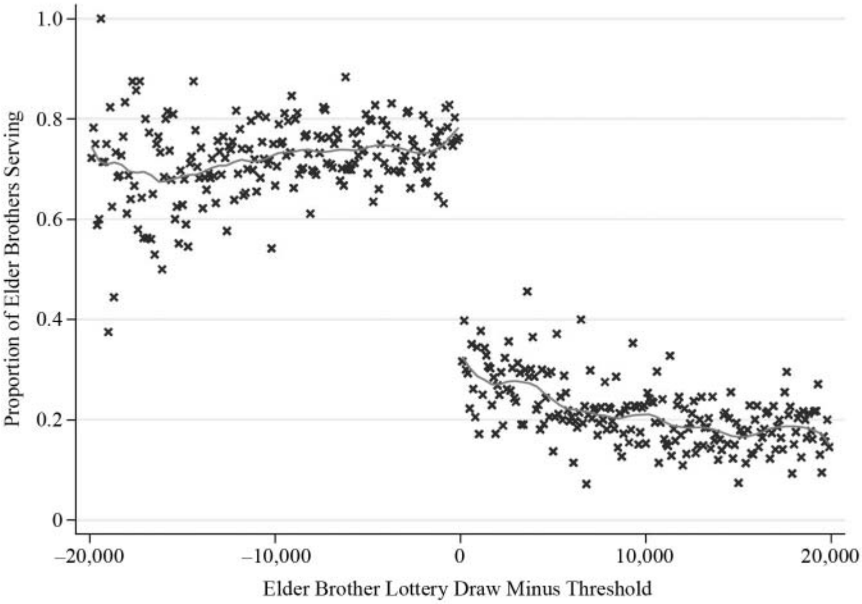

Figure 2

Elder Brother Service Probability by Elder Brother Lottery Draw

Notes: Crosses indicate proportions serving among bins containing 100 consecutive lottery draws. The lines are (Epanechikov) kernel-weighted (second-degree) local polynomials estimated on the bin proportions for each side of the threshold.

months and (ii) they drew a lottery number below the threshold. We refer to these men as "drafted" regardless of whether or not they served, and regardless of whether or not they volunteered.

While lottery numbers in the U.S. Vietnam-era draft were assigned by birth date, in Denmark lottery numbers are generated by a third party (TDC A/S), and range from 1 to 36,000. Lottery thresholds for recent years are known to these men, as is the volatility of the threshold. Figure 2 shows the relationship between service probability and proximity to the lottery threshold.[20] Those below the threshold are drafted and are much more likely to serve than those above the threshold who were not drafted. Nonetheless, about 21 percent of those above the threshold volunteer. Service probability increases somewhat approaching the threshold from above or below. Although threshold proximity appears to encourage volunteering, because the threshold is announced only after volunteering is complete, this pattern is likely due to a desire to reduce future uncertainty among men who have drawn a low number.[21]

20. While the mean lottery number threshold during our enlistment years is 16,730, it ranges from 3,000 in the year 2000 to 36,000 in the year 2003. Correlation in the threshold from one enlistment period to the next is –0.39.

21. At the AFD all eligible men, regardless of their lottery number, express a preference for a certain branch of the military and where they would prefer to be stationed during service. Subject to the personnel needs of the

All of the men in our sample are fit for service, and they all draw a lottery number. Of them, 44 percent draw a number below the threshold and are drafted. Of a full male cohort, 37 percent are unfit for service, 36 percent are judged fit for service but do not serve, and 27 percent serve in the military. Twenty-eight percent of a cohort are drafted: 20 percent actually serve, and 8 percent do not (3 percent are conscientious objectors,[22] 4 percent later have poor health, 0.5 percent have a criminal record,[23] and 0.5 percent are either fined or imprisoned under the draft law).[24]

The length of military service is eight months over our sample period, although a small minority of placements can last longer; for example, service with the Mounted Royal Guards lasts 12 months. Service is performed in the Army (82 percent), Navy (7 percent), Air Force (5 percent), civil defense, and fire and rescue services (6 percent for the last three combined). Conscripts receive compensation for their time in the military, worth approximately \$3,000 per month in 2015,[25] which is 20 percent higher than the minimum gross wage in construction.

III. Method

We focus on the effect of elder brother military service on a younger brother's propensity to serve, which we model as follows:

$$Younger\_Military_i = \pi_0 + \pi_1 Elder\_Military_i + X_i\pi_2 + \upsilon_{it}$$

where *Younger_Military* is a binary indicator taking the value one if a younger brother in family *i* serves in the military, *Elder_Military* is a binary indicator taking the value of one if the elder brother in the family *i* serves in the military, and *X* is a set of control variables. An ordinary least squares (OLS) estimate of π_1 may be biased because the decision of an elder brother to join the military might be correlated with unobserved factors shared by a younger brother, such as family norms and other hard-to-measure background characteristics. To obtain an unbiased estimate of π_1 we use the draft lottery to provide exogenous variation in brother service status. We instrument *Elder_Military* with a binary indicator taking the value one if the elder brother is drafted, *Elder_Lottery*, as follows:

$$Elder\_Military_i = \delta_0 + \delta_1 Elder\_Lottery_i + X_i\delta_2 + \eta_i$$

A balanced random assignment gives unbiased instrumental variable (IV) estimates of π_1, and control variables should only improve precision. In our empirical analysis, we show that draft assignment is balanced on observed characteristics. Moreover, we

military, volunteers' preferred assignments will be given precedence over those of draftees who did not volunteer. Thus, there is an incentive to volunteer if one expects to have to serve anyway because volunteers are more likely to receive their preferred assignment.

22. Conscientious objectors are assigned to work for their local municipality in hospitals, libraries, care facilities for children or the elderly, etc. This civil service is of a similar eight-month duration, and the rate of pay is the same as for military service.

23. For practical purposes, criminal background checks are not run before the AFD.

24. We are unable to distinguish conscientious objectors from others who are drafted but do not serve. Thus, in our analysis conscientious objectors are classified as not serving.

25. Conscript compensation comprises a monthly taxable salary of 7,421 Danish Krone (DKK), a tax-free allowance of 6,230 DKK, and food and lodging.

check for signs of violations of randomization by comparing estimates from different specifications with different sets of control variables.

Draft status does not have a one-to-one correspondence with service status. Some choose to volunteer for military service, and a few refuse to serve, irrespective of the lottery outcome. Our IV estimator therefore provides a Local Average Treatment Effect (LATE) pertaining to elder brothers who would serve if they are drafted but who would otherwise not have served. The opportunity cost of serving for elder brothers who comply with the draft is greater than for elder brothers who volunteer. We keep this point in mind when interpreting the effect of an elder brother's serving on the younger brother's probability of doing so. As the lottery numbers and draft assignments are uncorrelated across brothers,[26] any positive estimated brother influence should be interpreted as an increased likelihood of a younger brother either volunteering, not refusing, or complying with the draft because an elder brother is forced to serve.

IV. Data

We have access to administrative records from the Danish Ministry of Defense on all fit-for-service men from birth cohorts 1976–1983 for AFQT scores, height, lottery number, the AFD half-year thresholds, and the potential starting half-year for their military service.[27] Thanks to the civil registration number, military records are linked to other administrative registers at Statistics Denmark, containing information on demographic characteristics and family relationships. For our estimation sample, we select the first two nontwin maternal brothers who are Danish citizens, resident in Denmark when turning 18, born in these cohorts, and both fit for service. This criterion gives us a sample of 13,124 brother pairs, that is, 26,248 individuals.[28]

Table 1 shows descriptive statistics, with all the variables measured either during the AFD year or earlier. Columns 2–5 show our main estimation sample of fit-for service two-brother pairs, along with all fit-for-service men from the same birth cohorts in Column 1. Column 6 shows descriptive statistics for a 5 percent sample of all men, regardless of fit-for-service status.[29] The main difference between samples is for AFQT scores, which are higher in the fit-for-service population (Columns 1–5) than for all men attending an AFD (Column 6). This difference is not surprising because the AFQT score is an explicit military selection criterion.[30] Among fit-for-service men, our brother pairs were slightly heavier at birth and have parents with slightly more schooling. Among our brother pairs,

26. See Table 2 for draft assignment associations and Online Appendix Table A.1 for lottery number associations.

27. The 1976 cohort is the first that the Ministry of Defense records with computerized lottery numbers. Albæk et al. (2017) digitize records for the 1964 birth cohort from one recruitment district. The 1983 birth cohort is the last we consider because of a change in the military service law reducing length of service from eight to four months for later cohorts.

28. See Online Appendix Table A.3, breaking down our sample selection.

29. For the middle and bottom Panels of Column 6 we consider men born 1976–1983, whereas in the top panel of Column 6 we consider cohorts of men born 1988–1990 because in the latter cohorts information on the test results for men declared unfit for service on the AFD is also available.

30. True differences may be even larger because AFQTs are taken only by those attending a recruitment event. However, we only observe AFQT scores for everyone attending recruitment events from 2006, whereas our estimation sample is observed about a decade earlier, and cohort differences might explain some of the differences between columns.

Table 1
Summary Statistics

	Fit-for-Service Men (1)	Main Estimation Sample				5 Percent Population (6)
		Served = 1 (2)	Served = 0 (3)	Elder (4)	Younger (5)	
Height (cm)	180.36	180.42	180.43	180.38	180.46	179.93
	(6.59)	(6.49)	(6.64)	(6.55)	(6.60)	(6.77)
AFQT score	44.57	45.10	45.37	45.57	44.94	41.28
	(8.34)	(8.03)	(8.47)	(8.37)	(8.19)	(10.30)
Observations	155,750	11,377	14,871	13,124	13,124	7,486[a]
Raised in single-parent family	0.18	0.16	0.15	0.14	0.17	0.19
	(0.38)	(0.37)	(0.36)	(0.35)	(0.37)	(0.39)
Placed in out-of-home care	0.04	0.04	0.03	0.04	0.03	0.05
	(0.20)	(0.20)	(0.16)	(0.19)	(0.17)	(0.22)
Nonimmigrant and nondescendant	0.96	0.96	0.95	0.96	0.96	0.96
	(0.20)	(0.19)	(0.21)	(0.20)	(0.20)	(0.20)
Observations	155,750	11,377	14,871	13,124	13,124	14,390[b]

(*continued*)

Table 1 (*continued*)

	Fit-for-Service Men	Main Estimation Sample				5 Percent Population
		Served = 1	Served = 0	Elder	Younger	
	(1)	(2)	(3)	(4)	(5)	(6)
Birth weight (kg)	3.372	3.407	3.430	3.290	3.550	3.342
	(0.655)	(0.651)	(0.627)	(0.630)	(0.610)	(0.599)
Household income at age 15 (DKK)	133,792	129,177	131,893	125,970	138,324	130,579
	(57,685)	(57,945)	(56,453)	(51,627)	(60,449)	(56,554)
Mother's years of schooling	11.66	11.73	11.91	11.87	11.91	11.69
	(2.88)	(2.85)	(2.90)	(2.83)	(2.83)	(2.80)
Father's years of schooling	12.03	12.12	12.33	12.30	12.32	12.19
	(3.18)	(3.09)	(3.14)	(3.07)	(3.08)	(3.04)
Observations	149,124	10,688	14,268	12,478	12,478	14,390[b]

Notes: Means, standard deviations in parentheses. Statistics in Columns 1–5 relate to 1976–1983 male birth cohorts who are fit for service. Height is measured on AFD. Birth weight is measured by midwife. Raised in single-parent family is an indicator variable for household status on 17th birthday. Placed in out-of-home care is an indicator variable taking the value one if having lived in an institution or foster home before turning 18. Household income at 15 is equivalized according to the formula (sum of income in the household + transfers – taxes)/(1*first_adult + 0.7*second_adult + 0.5*number_of_children) and reflated to 2012 prices by the CPI. Mother's and father's schooling are measured when son is age 15.

[a]Statistics are for 5 percent of 1988–1990 male birth cohorts attending the AFD.

[b]Statistics are for 5 percent of full 1976–1983 male birth cohorts. AFQT is taken on the AFD.

Table 2
Randomization Balance Check: Effect of Predetermined Characteristics on the Probability of Elder Brother Being Drafted

	Elder (1)	Elder (2)	Younger (3)	Younger (4)
AFQT	0.00043	0.00036	–0.00009	–0.00005
	(0.00050)	(0.00053)	(0.00055)	(0.00058)
Height (cm)	–0.00072	–0.00086	–0.00010	–0.00009
	(0.00063)	(0.00067)	(0.00067)	(0.00070)
Nonimmigrant and nondescendant	0.01243	–0.00986	0.01344	0.01507
	(0.02007)	(0.02888)	(0.02203)	(0.03314)
Single parent raised	–0.00857	–0.00629	0.01076	0.01258
	(0.01174)	(0.01219)	(0.01162)	(0.01207)
Out-of-home care	–0.00839	–0.01295	0.02986	0.02572
	(0.02188)	(0.02289)	(0.02591)	(0.02699)
Younger brother drafted			0.00634	0.00381
			(0.00988)	(0.01014)
Birth weight (kg)		0.00311		0.00271
		(0.00666)		(0.00754)
HH income (TDKK)		–0.00005		–0.00000
		(0.00009)		(0.00008)
Mother's schooling		0.00007		–0.00006
		(0.00014)		(0.00015)
Father's schooling		–0.00000		–0.00014
		(0.00013)		(0.00014)
F-statistic	0.60909	0.39600	0.56074	0.52550
F-stat. *p*-value	0.69298	0.93767	0.76190	0.87346
Observations	13,124	12,478	13,124	12,478

Notes: Robust standard errors in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.010$. The table contains estimates from four separate OLS regressions explaining elder brother draft status. These regressions also control for birth year, birth month, half year of the AFD, and half year of potential service start. Columns 1–2 use elder brother characteristics, and Columns 3–4 use younger brother characteristics. Columns 2 and 4 contain 646 fewer observations because of missing information for one or both brothers (about birth weight, household income when aged 15, and maternal or paternal schooling).

those who serve have parents with slightly less schooling and come from households with 2 percent less income on average. The main difference between younger and elder brothers is for equivalized household income at age 15, which is higher for younger brothers because an elder brother is likely living outside the parental home. In sum, Table 1 makes clear that our brother pair estimation sample is economically similar to other fit-for-service men and quite similar to men attending an AFD as a whole. Despite these differences being economically small, standardized differences are statistically significant.[31]

Given that the tests on the AFD are performed before the lottery, we can use the test information to assess whether the lottery randomization is balanced. Moreover, we can use our extensive information on other background factors for the same purpose. If the lottery is a balanced randomization, predicting assignment based on the test results and pre-determined characteristics should not be possible. Table 2 presents tests for whether the elder brother's draft assignment is orthogonal to observed characteristics.[32] Specifically, each column presents OLS coefficients from separate regressions explaining elder brother draft assignment through elder brother characteristics in Columns 1–2 and explaining elder brother draft assignment through younger brother characteristics in Columns 3–4.

As expected, assignment is not predicted by the predetermined characteristics. Coefficients are individually and jointly insignificant, and assignment is balanced on observed characteristics. Most importantly, Columns 3–4 show that elder brother assignment is independent of younger brother observed characteristics. This independence of peer characteristics from focal person assignment meets Angrist's (2014) criterion for a compelling research design for studying peer effects. In Columns 1 and 3 of Table 2, we do not include birth weight, parental income, or parental education because we would lose some observations. We instead include these variables in Columns 2 and 4, and the random assignment is still balanced.

V. Results

Our large sample allows for precise estimation of main effects, and multiple random assignments allow for a variety of robustness checks and analyses of causal mechanisms. In this section we present mean estimates, and we check robustness to several potential threats to identification, consider heterogeneity in spillovers, conduct a compliers analysis distinguishing selection from causation, present effects on industry of employment, and end with an extension to more than two siblings.

A. Main Results

Table 3 presents estimates of the relationship between elder brother draft and service status and younger brother service status. Each cell in the table contains the coefficient of interest from separate regressions. Each column presents estimates with different sets

31. See Online Appendix Table A.4 for standardized differences between the different samples presented in Table 1.

32. Online Appendix Table A.1 shows that elder brother's lottery draw is orthogonal to his own and his younger brother's observed characteristics. While we cannot observe parental military service directly in our data, we do know industry of employment from 1980 onwards for many parents, and in Online Appendix Table A.2 we present an extended balancing test including dummies for mother and father employment in the defense industry. These dummies are insignificant, and both lottery numbers and draft status of younger brothers remain balanced.

Table 3
Elder Brother's Draft Status, Elder Brother's Military Service, and Younger Brother's Service

	Draft Controls (1)	Basic (2)	Extended I (3)	Extended II (4)	Extended III (5)
Panel A: OLS Regression: Outcome Younger Brother Service					
Elder brother served	0.0878***	0.0901***	0.0903***	0.0898***	0.0888***
	(0.0074)	(0.0077)	(0.0077)	(0.0077)	(0.0079)
Adjusted R^2	0.2663	0.2729	0.2743	0.2752	0.2752
Panel B: Reduced-Form Regression: Outcome Younger Brother Service					
Elder brother drafted	0.0166**	0.0160**	0.0165**	0.0164**	0.0170**
	(0.0075)	(0.0080)	(0.0080)	(0.0080)	(0.0082)
Adjusted R^2	0.2588	0.2656	0.2670	0.2679	0.2682
Panel C: First-Stage Regressions: Outcome Elder Brother Service					
Elder brother drafted	0.5245***	0.5145***	0.5147***	0.5149***	0.5122***
	(0.0074)	(0.0078)	(0.0078)	(0.0078)	(0.0080)
Adjusted R^2	0.2724	0.3014	0.3070	0.3081	0.3065
Mean of dep. var.	0.439	0.439	0.439	0.439	0.439
Panel D: Second-Stage IV Regressions: Outcome Younger Brother Service					
Elder brother served	0.0317**	0.0311**	0.0321**	0.0320**	0.0332**
	(0.0143)	(0.0155)	(0.0155)	(0.0155)	(0.0159)
	[0.017]	[0.030]	[0.025]	[0.022]	[0.024]
F-stat. excl. inst.	4,916	4,277	4,313	4,322	4,058
Hausman test χ^2	21.27***	19.19***	18.75***	18.51***	16.08***
Mean of dep. var.	0.428	0.428	0.428	0.428	0.428
Observations	13,124	13,124	13,124	13,124	12,478

Notes: Robust standard errors in parentheses. *$p < 0.10$, **$p < 0.05$, ***$p < 0.010$. The table presents estimates from 20 different regressions, with different estimators in each panel (A–D) and different specifications in each column. Column 1 only controls for younger brother draft status. Column 2 has basic controls for both brothers, with dummies for year of birth, month of birth, half year of the AFD and half year of potential service start, as well as draft status for the younger brother only. Column 3 additionally includes quadratic terms for height and AFQT scores for both brothers. Column 4 adds controls for both brothers for immigrant or descendant-of-immigrant status, living in a single parent household at age 15, and having experienced out-of-home care sometime before age 18. Column 5 adds controls for both brothers for birth weight, household income at age 15, and maternal schooling and paternal schooling. We drop 646 brother pairs for Column 5 because of missing additional information for one or both brothers. In Panel D, elder brother service status is instrumented with elder brother draft status. For each specification, a Hausman (1978) test of consistency of OLS estimates compared to IV estimates rejects the null hypothesis. Hence OLS estimates are inconsistent because of endogeneity, and IV estimates are preferred. Square brackets contain empirical p-values following an approach similar to that used in Carrell, Hoekstra, and West (2016) and Kofoed and mcGovney (2019). For each elder brother we randomly draw 1,000 younger brothers born in the same month and year as the true younger brother. Empirical p-values show the proportion of coefficients estimated using these randomly matched younger brothers that are higher than the coefficient estimated from the true younger brother match.

of explanatory variables. As the lottery is random and balanced, the covariates should serve mainly to increase the precision of our estimates.

In Panel A of Table 3, we first show OLS estimates of the relationship between the elder and younger brothers' service status. These regressions do not isolate the causal spillover effect, and the relationship rather reflects the influence of both shared background factors and any spillover. The OLS estimates are large, positive, and significant, where having an elder brother serving is associated with a nine percentage point increase in the likelihood that a younger brother serves.

Panel B shows reduced-form coefficients of the effect of the elder brother's draft status on the probability that the younger brother serves. Elder brother draft increases the younger brother's probability of service by two percentage points, and the effect is stable across specifications. As we use only the variation in the elder brother's draft status coming from the lottery for identification, and lottery numbers and draft status are uncorrelated between brothers, these regressions isolate a spillover effect.[33] As not all elder brothers comply with their draft assignment, to identify the spillover effect of having an elder brother serving per se, we need to scale this reduced-form effect by the corresponding effect of the lottery on the likelihood of the elder brother's serving in the military.

Panel C shows the first-stage estimates, where military service status of the elder brother is regressed on elder brother draft status. The estimates show that being drafted increases the probability of military service by 52 percentage points, and the effect is highly significant. Adding control variables has very little impact on the estimated effect of the draft. Indeed, because with balanced randomization these controls should matter only for increasing the precision of the estimates, these results are expected.

We next focus on our main IV estimates (Panel D in Table 3). The first column of Panel D shows a positive and significant effect of having an elder brother serving on younger brother service. The magnitude of the estimate suggests that having an elder brother serving increases the probability that a younger brother serves by three percentage points, about a 7 percent increase in the probability at the mean. This LATE measures the effect of having an elder brother who would not have served unless drafted on a younger brother's decision to serve (that is, either comply with the draft assignment to serve or volunteer for service). The estimated effects are very stable across columns with various sets of covariates.[34] While highly significant, our spillovers are closer in size to those found in other sibling studies (Dahl, Loken, and Mogstad 2014; Qureshi 2018a) than to those found in parent–child studies (Campante and Yanagizawa-Drott 2015; Dahl, Kostøl, and Mogstad 2014).

B. Robustness Checks

In this subsection we consider a number of threats to identification in family spillover models in general and in our context in particular, and we perform four sets of robustness

33. See Online Appendix Tables A.1 and A.5, respectively.

34. To allow for strategic volunteering among those with low lottery numbers (for example, because they want to reduce the uncertainty of their future service status), in Online Appendix Table A.5 we present estimates using both lottery draws and draft status as instruments. IV estimates of elder brother service effects on younger brother service are very similar regardless of our inclusion of the lottery draw. Because the results do not change when we allow for strategic behavior by expanding the instrument set, in the remainder of the paper we use only draft status to instrument for service status.

checks to meet these challenges. First, to test whether spillovers are sensitive to conditioning on both brothers being fit for service, we extend the sample to include some unfit brothers. Second, to test our exclusion restriction, we check for service spillovers outside the family by matching placebo brothers according to their membership in various social interaction groups (for example, attending the same AFD or living in the same recruitment area). Third, we consider the reflection problem by using double random assignment to check for reverse causality, that is, the younger brother affecting the elder brother. Fourth, we consider younger brother outcomes that should be "immune" to elder brother service: height and AFQT scores.

1. *Sample selection and fit-for-service status*

Although, the Ministry of Defense data to which we have access covers all men born 1976–1983 who are assessed as fit for service, we also know the dates of birth of all the brothers of these men, regardless of their fit-for-service status.[35] If a brother born 1976–1983 is missing from the Ministry of Defense data, we know that he was not fit for service because of death, emigration, disability, or failing AFD assessments, that is, either from not participating on the AFD or from failing the AFD tests. The inference we have made thus far is about spillovers in service status conditional on both brothers being fit for service. By expanding our estimation data set to include brother pairs where one is unfit for service, we can test whether estimated service spillovers are sensitive to conditioning on fitness.[36] For this exercise we extend our sample of fit-for-service brother pairs to include other brother pairs who are Danish citizens, residents when they turn 18, their mother's first- and second-born boys, and *at least one* fit for service.

Estimates of service spillovers including unfit brothers appear in Table 4. Column 1 reproduces our main estimates without covariates from Table 3 for brothers who are both fit for service, and Columns 2 and 3 include unfit elder and younger brothers, respectively. The estimates of 8.0 percent service spillovers for the sample including unfit elder brothers and 6.9 percent including unfit younger brothers are similar to the 7.4 percent found conditioning on both brothers being fit for service. Thus, selecting a sample of brothers who are both fit for service does not bias our estimates.

While estimates of elder brother service on younger brother service are unbiased by conditioning on fit-for-service status, effects on fit-for-service status may still be a relevant spillover channel. Table 5 presents estimates of elder brother service effects on younger brother fit-for-service status.

In Table 5 we sample brother pairs where the elder is fit for service, but the younger might not be (as in Table 4, Column 3) and run IV regressions where the dependent variable is a binary indicator taking the value one if the younger brother is fit for service, and the endogenous variable is elder brother service instrumented with elder brother draft status. Elder brother service status has no effect on younger brother fit-for-service status.[37]

35. If no brother from these cohorts is assessed as fit for service, we do not observe the family.
36. Online Appendix Table A.6 presents descriptive statistics for the extended sample, where at least one brother needs to be fit for service.
37. In Online Appendix Table A.7, we sample brother pairs at ages 9 and 14 where the elder is fit for service at age 18 but the younger might not be, similarly finding no effects of elder service on younger brother fit-for-service status.

Table 4
Selection Check: Elder Brother's Draft Status, Elder Brother's Military Service, and Younger Brother's Service, Including Unfit Brothers

	Both Brothers Fit for Service (1)	Younger Fit for Service (2)	Elder Fit for Service (3)
Panel A: OLS Regressions: Outcome Younger Brother Service = 1			
Elder brother served	0.08783***	0.07932***	0.06343***
	(0.00745)	(0.00677)	(0.00536)
Adjusted R^2	0.26631	0.26321	0.36564
Panel B: Reduced-form Regressions: Outcome Younger Brother Service = 1			
Elder brother drafted	0.01662**	0.02082***	0.01073**
	(0.00753)	(0.00686)	(0.00540)
Adjusted R^2	0.25882	0.25800	0.36106
Panel C: First-Stage Regressions: Outcome Elder Brother Service = 1			
Elder brother drafted	0.52458***	0.61122***	0.51840***
	(0.00748)	(0.00598)	(0.00627)
Adjusted R^2	0.27244	0.36557	0.26699
Mean of dep. var.	0.43927	0.31788	0.43542
Panel D: Second-Stage IV Regressions: Outcome Younger Brother Service = 1			
Elder brother served	0.0317**	0.0341***	0.0207**
	(0.0143)	(0.0112)	(0.0104)
F-stat. excl. inst.	4,916	10,450	6,845
Mean of dep. var.	0.428	0.424	0.299
Observations	13,124	18,136	18,791

Notes: Robust standard errors in parentheses. $*p<0.10$, $**p<0.05$, $***p<0.010$. The Table presents estimates from 12 separate regressions, some including unfit brothers. For all columns of Table 4, the specification is the same as for Table 3, Column 4. Both brothers have to be Danish citizens and resident when they turn 18. Estimates from Table 4, Column 3 based on the sample of brother pairs where both are fit for service are reproduced here in Column 1. Column 2 presents estimates from a sample of brother pairs where the younger brother is fit for service, but the elder brother might not be, that is, extending the sample of Column 1 to include pairs where the younger is fit for service, but the elder brother is not fit for service. Column 3 presents estimates from a sample of brother pairs where the elder brother is fit for service, but the younger brother might not be, that is, extending the sample of Column 1 to include pairs where the elder is fit for service, but the younger brother is not fit for service.

Table 5
Selection Check: Explaining Younger Brother Fit-For-Service Status

Panel A: OLS Regressions: Outcome Younger Brother Fit for Service = 1	
Elder brother served	0.0109
	(0.00675)
Adjusted R^2	0.0000864
Panel B: Reduced-Form Regressions: Outcome Younger Brother Fit for Service = 1	
Elder brother drafted	–0.00638
	(0.00677)
Adjusted R^2	0.00000600
Panel C: First-Stage Regressions: Outcome Elder Brother Service = 1	
Elder brother drafted	0.518***
	(0.00627)
Adjusted R^2	0.267
Mean of dep. var.	0.435
Panel D: Second-Stage IV Regressions: Outcome Younger Brother Fit for Service = 1	
Elder brother served	–0.0123
	(0.0131)
F-stat. excl. inst.	6,845
Mean of dep. var.	0.698
Observations	18,791

Notes: Robust standard errors in parentheses. *$p<0.10$, **$p<0.05$, ***$p<0.010$. The Table presents estimates from four separate regressions. The sample contains brother pairs where the elder is fit for service, but the younger might not be the same sample as in Table 4, Column 2. Panel A presents OLS estimates with dependent variable taking the value one if younger brother is fit for service and zero otherwise, explained by elder brother service status. Panel B presents reduced-form estimates of elder brother draft status explaining younger brother fit-for-service status. Panel C presents first-stage estimates of elder brother draft status explaining elder brother service status. Panel D presents IV estimates explaining younger brother fit-for-service status with elder brother service status instrumented by elder brother draft status. Explanatory variables are the same as for Table 3, Column 4.

In another selection check, we match brother pairs at age nine,[38] where at least the elder brother is fit for service, but the younger brother might not be, and run regressions explaining younger brother emigration or death after the elder brother turns 18. In Online Appendix Table A.8, we find that elder brother service *reduces* younger brother emigration, but with significance only at the 10 percent level. Thus, in our main analysis, we do not exclude a spillover channel by conditioning on both brothers being fit for service.

38. Age nine is the earliest we can observe residence, migration, and vital status for the cohorts in our data.

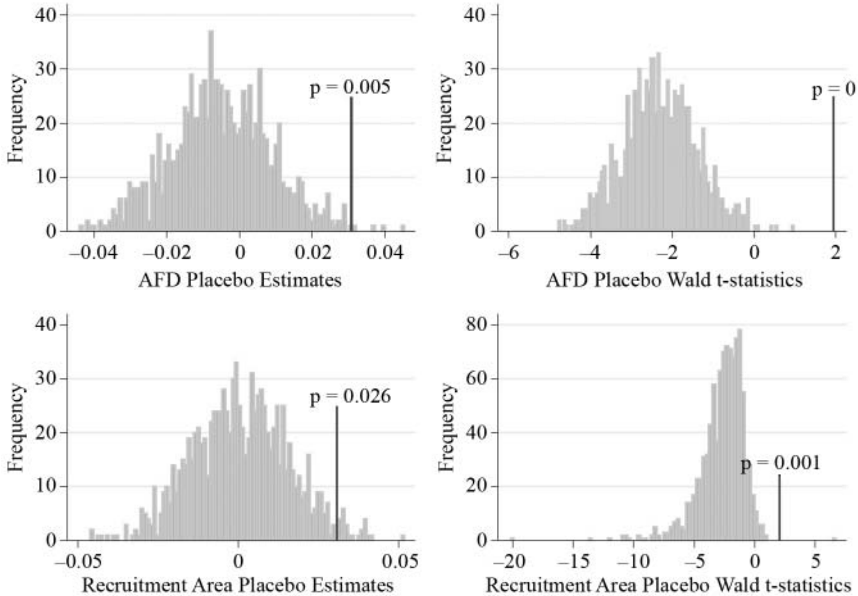

Figure 3
Placebo Younger Brother Service Effects

Notes: Elder brothers are matched with placebo younger brothers, and IV regressions explain placebo younger brother service status with elder brother service status instrumented by elder brother service status. 1,000 regressions are run drawing placebo younger brothers from the same AFD. The upper left panel presents a histogram of these service spillover estimates; the upper right panel presents a histogram of associated Wald t-statistics correcting for placebo group clustering (Cameron and Miller 2015). The lower panels present histograms of estimates and Wald t-statistics from 1,000 regressions drawing placebo younger brothers from the same recruitment area. The bold line locates estimates and Wald t-statistics for true younger brothers, annotated with the implied p-value among placebos. Regression specifications are the same as for Table 3, Panel D, Column 4.

2. Placebo tests of exclusion restrictions

For our IV estimates to be valid, we need an exclusion restriction satisfied, whereby elder brother draft status only affects younger brother service status through elder brother service. If spillovers in service status operate outside the family, for example, through the neighborhood or via effective recruitment campaigns, the exclusion restriction might be violated. One way to check for spillovers outside the family is to match placebo brother pairs according to membership in groups through which influence might be transferred and compare these placebo estimates with estimates based on true brother pairs.[39] We simulate 1,000 placebo brother pairs for various groupings and present the distributions of estimates in Figure 3.

39. Similar exercises have been performed for U.S. Air Force Academy peer group assignment (Carrell, Sacerdote, and West 2013; Carrell, Hoekstra, and West 2016) and Korean middle school class assignment (Lim and Meer 2017).

The upper panels of Figure 3 are for elder brothers matched with placebo younger brothers who attended the same AFD as the true younger brother, and the lower panels match placebo younger brothers from the same recruitment area. Figures on the left are distributions of estimated service coefficients, and figures on the right are Wald *t*-statistics correcting for placebo group clustering (Cameron and Miller 2015). The darker bars indicate the position of our estimate based on the true brother pair, annotated with the implied *p*-value. That brother-based estimates are so distinctive from estimates based on other groupings supports the likelihood of spillovers operating inside the family.[40]

In our sample of fit-for-service brother pairs, both brothers participated in the draft lottery. Although the spillover we measure is from elder brother service to younger brother service, the fact that both brothers are randomly assigned to service allows us to conduct a placebo-like test for whether the spillover runs from a younger to an elder brother. By doing so, we test for the relevance of Manski's (2000) "reflection problem,"—that is, while I affect my peer, my peer also affects me. Estimates from this placebo regression of younger brother service status (instrumented with younger brother draft status) explaining elder brother service status appear in Table 6. Despite OLS results very similar to those in Table 3, the estimated reduced-form and IV coefficients are small and insignificant throughout, suggesting that the reflection problem is not an issue in our context. Given that the elder brother attends his AFD earlier than the younger brother—that is, draft assignment of the elder brother precedes that of the younger brother—this result is expected.[41]

As another robustness check, we investigate whether elder brother service status has an effect on younger brother outcomes such as height or AFQT score. Such effects could reflect spurious younger brother selection on height, test-taking effort, or attempts by the younger brother to avoid being declared fit for service in general.[42] We find no effect of the elder brother's serving on the younger brother's AFQT scores or on height, suggesting that younger brothers do not change their effort on the AFQT and do not spuriously select on height in response to elder brother's service status.[43]

40. In Online Appendix Table A.9 we present *p*-values from a range of alternative placebo groupings for younger and elder brothers, none of which suggest that spillovers are operating outside the family.

41. In principle, a younger brother's service may spill over to an elder brother's decision. An elder brother who was not drafted may later decide to volunteer, possibly as a function of the younger brother's service. However, the scope for such effects is small. The average birth spacing in our sample is three years, and most males serve at age 20. As almost all men who will serve have done so by age 25, only a small window exists for an elder brother to act on the younger brother's service. The average gap between potential service dates of elder and younger brother is 2.9 years (standard deviation 1.9), and only 2 percent of elder brothers serve after their younger brother. Results are robust to dropping these observations from the analysis.

42. In Online Appendix Table A.10 we first examine whether there is any effect of the elder brother's serving on an eligible younger brother's AFQT scores or height. AFQT scores and height are selection criteria not only for the military but also for our data. If younger brothers manage to manipulate these measures outside the eligible range, we will not detect this manipulation in Table A.10. These regressions are thus conditional on both brothers being declared fit for service; that is, the regressions are run on our main sample.

43. Spillover effects may also work indirectly. When an elder brother leaves the household for an extended period, a younger brother might gain in terms of parental input, such as attention or help with homework. Although we have already shown that there is no effect of an elder brother serving on the AFQT score of a younger brother, we can also look for effects on a younger brother's future education and income when an elder brother is drafted. When we do so, however, the point estimates are small and insignificant (not shown).

Table 6
Placebo—Younger Brother's Draft Status, Younger Brother's Military Service, and Elder Brother's Service

	Draft Controls (1)	Basic (2)	Extended I (3)	Extended II (4)	Extended III (5)
Panel A: OLS Regression: Outcome Elder Brother Service					
Younger brother served	0.0792***	0.0837***	0.0833***	0.0826***	0.0814***
	(0.0074)	(0.0076)	(0.0075)	(0.0075)	(0.0077)
Adjusted R^2	0.2786	0.3079	0.3133	0.3144	0.3126
Panel B: Reduced-Form Regression: Outcome Elder Brother Service					
Younger brother drafted	–0.0009	0.0016	0.0018	0.0012	0.0011
	(0.0074)	(0.0083)	(0.0083)	(0.0082)	(0.0085)
Adjusted R^2	0.2724	0.3014	0.3070	0.3081	0.3065
Mean of dep. var.	0.439	0.439	0.439	0.439	0.439
Panel C: First-Stage Regressions: Outcome Younger Brother Service					
Younger brother drafted	0.5069***	0.4977***	0.4975***	0.4968***	0.4964***
	(0.0074)	(0.0085)	(0.0085)	(0.0085)	(0.0087)
Adjusted R^2	0.2588	0.2656	0.2670	0.2679	0.2682
Mean of dep. var.	0.427	0.427	0.427	0.427	0.427
Panel D: Second-Stage IV Regressions: Outcome Elder Brother Service					
Younger brother served	–0.0017	0.0032	0.0036	0.0025	0.0022
	(0.0147)	(0.0167)	(0.0166)	(0.0166)	(0.0171)
F-stat. excl. inst.	4,580	3,420	3,422	3,414	3,232
Mean of dep. var.	0.439	0.439	0.439	0.439	0.439
Observations	13,124	13,124	13,124	13,124	12,478

Notes: Robust standard errors in parentheses. *$p<0.10$, **$p<0.05$, ***$p<0.010$. This table presents the reverse-regression placebo of Table 4. The table presents estimates from 20 different regressions, with different estimators in each panel (A–D) and different specifications in each column. Column 1 only controls for elder brother draft status. Column 2 has basic controls for both brothers, with dummies for year of birth, month of birth, half year of the AFD, and half year of potential service start, as well as draft status for the elder brother only. Column 3 additionally includes quadratic terms for height and AFQT scores for both brothers. Column 4 adds controls for both brothers for immigrant or descendant-of-immigrant status, living in a single parent household at age 15, and having experienced out-of-home care sometime before age 18. Column 5 adds controls for both brothers for birth weight, household income at age 15, and maternal schooling and paternal schooling. We drop 646 brother pairs for Column 5 because of missing additional information for one or both brothers. In Panel D, younger brother service status is instrumented with younger brother draft status.

Estimates are robust to the threats to identification that we have considered. “Immune” younger brother outcomes are not affected by elder brother service; spillovers operate within the family rather than through other groups, and causation runs only from elder to younger brother, suggesting an absence of the reflection problem. Excluding unfit brothers does not bias estimates of service effects, and there is no spillover to fit-for-service status. This robustness is reassuring. In the next section we further investigate heterogeneity and the behavioral mechanisms driving the mean effects.

C. Heterogeneity and Mechanisms

Our estimates thus far are average effects. However, the strength of sibling spillovers may depend on several factors. If one mechanism driving the sibling effects is the provision of information, we expect less of a positive spillover effect when conscription entails large opportunity costs. Moreover, we expect that the closer the brothers are and the longer they have lived together, the stronger the interaction and the greater their influence on one another. We now explore these types of heterogeneity in more detail by splitting the data according to birth spacing (Table 7), birth order (Table 8), time living together during childhood (Table 9), and relative characteristics (Tables 10 and 11).

Table 7 shows IV estimates of the effect of the elder brother’s service on the younger brother’s service for brothers with different birth spacing. Although spillovers are higher for brothers born closer together, sample sizes are smaller and estimates become less precise, making them insignificantly different from each other.

Table 7 considers spacing between fit-for-service brother pairs in our main sample, regardless of other siblings born before the first or in between the first and second fit-for-service brothers. To investigate the sensitivity of our estimates to the presence of these other siblings, we split our sample accordingly in Table 8. Although differences are insignificant, we can see that estimates are driven by fit-for service brothers who are their mother’s first- and second-born children.

In Table 9, we show IV estimates of the effect of the elder brother’s service on the younger brother’s service according to different measures of years spent together in the family during childhood, that is, brothers and both parents (Panel A), brothers together (Panel B), and years living with father (Panel C). From Columns 1–4, the family spends more time together. Although the differences are insignificant, the longer the family has spent together, especially the longer brothers have lived together, the greater the point estimates of spillovers.

Military service has been shown to have opportunity costs that vary by labor market prospects, with men with high AFQT scores or men who are tall facing the greatest earnings penalties (Bingley, Lundborg, and Vincent Lyk-Jensen 2020). If elder brothers who are forced to serve make their younger brothers aware of these differential opportunity costs, we would expect to see greater spillovers for men who have below-median AFQT scores and below-median height compared to men who are above the median. In Tables 10 and 11, we look for heterogeneity in spillovers by AFQT scores and height. While differences by AFQT scores are largely insignificant, differences by height are intriguing, with greater spillovers for elder brothers below the median height and younger brothers above the median height.

Table 7
Spillovers by Spacing

	All (1)	<60 Months (2)	<48 Months (3)	<36 Months (4)	<24 Months (5)	<18 Months (6)
Elder brother served	0.0320**	0.0370**	0.0399**	0.0526**	0.0634*	0.0890
	(0.0155)	(0.0163)	(0.0177)	(0.0219)	(0.0347)	(0.0619)
	[0.0016, 0.0622]	[0.0050, 0.0689]	[0.0052, 0.0746]	[0.0096, 0.0954]	[–0.0045, 0.1213]	[–0.0324, 0.2103]
F-stat. excl. inst.	4,322	3,860	3,264	2,082	820	223
Mean of dep. var.	0.428	0.424	0.424	0.431	0.438	0.437
Observations	13,124	11,831	10,180	6,905	2,706	927

Notes: Robust standard errors in parentheses and 95 percent confidence intervals in brackets. *$p < 0.10$, **$p < 0.05$, ***$p < 0.010$. The table presents IV estimates of service spillovers from six separate regressions for different samples restricting the birth spacing between brothers, progressively from under 60 months in Column 2 to under 18 months in Column 6. The specification is the same as in Table 3, Panel D, Column 4, and those unrestricted estimates are reproduced here in Column 1.

Table 8
Spillovers by Birth Order

	Elder First (1)	Elder Later (2)	Younger Second (3)	Younger Later (4)
Elder brother served	0.0370**	0.0215	0.0374**	0.0216
	(0.0173)	(0.0347)	(0.0177)	(0.0317)
	[0.0031, 0.0708]	[–0.0464, 0.0894]	[0.0027, 0.0721]	[–0.0406, 0.0837]
F-stat. excl. inst.	3,483	807	3,294	998
Mean of dep. var.	0.430	0.419	0.429	0.423
Observations	10,402	2,722	9,937	3,187

Notes: Robust standard errors in parentheses and 95 percent confidence intervals in brackets. *$p < 0.10$, **$p < 0.05$, ***$p < 0.010$. The table presents IV estimates of service spillovers from four separate regressions for different samples split according to elder and younger brother birth ordering. The specification is the same as in Table 3, Panel D, Column 4.

The pattern of spillovers by height and AFQT scores is not consistent with an opportunity cost explanation. While task assignments in the military are not made on the basis of AFQT scores, a minority of army placements have maximum or minimum height requirements, for example, the Mounted Royal Guard (maximum 190 cm) and the Royal Life Guards (minimum 175 cm).[44] As volunteers are more likely to obtain their desired assignment (compared to draftees who do not volunteer), tall younger brothers may be motivated to volunteer in the hope of these prestigious assignments. Elder brothers below median height are more likely to face a minimum height constraint and may therefore also be more likely to communicate this requirement to their younger brothers. While much information about military service is publicly available, we speculate that elder brothers who serve are likely to have other insights into the assignment process, for example, the advantages of volunteering, making service more transparent and potentially attractive to their younger brothers.

We also look for heterogeneity by splitting the data in various ways—maternal schooling, household income at age 15, and elder brother potential service date—but find no significant differences (see Online Appendix Table A.11).[45] While none of the estimates based on different subsamples by birth spacing, birth order, or time spent together are significantly different from each other, point estimates indicate that our results are driven by closely spaced brothers who are their mothers first two births and have lived together with both parents for many years. It makes sense that spillovers are greatest in groups where members have the most exposure to one another.

44. AFQT test scores are not considered for assigning fit-for-service men to tasks. However, volunteering for different placements may be correlated with AFQT scores. We observe that, moving from the bottom to the top AFQT score quartile, assignment to the Air Force increases from 3.2 to 6.7 percent, assignment to the Navy falls from 7.4 to 6.3 percent, and assignment to the Army falls from 83.6 to 81.1 percent.

45. During our sample period, Denmark was involved in UN-led peace-keeping missions in the Balkans until 1999, and from 1999 in NATO-led peace-enforcing missions in Kosovo, in Afghanistan (2002), and in Iraq (2003) with the coalition. We find no differences in spillovers when we split the data by elder brother potential service date before or after the beginning of 1999, when the nature of the missions changed.

Table 9
Spillovers by Family Time Spent Together

	>0 Years (1)	>5 Years (2)	>10 Years (3)	>12 Years (4)
Panel A: With Elder Brother, Mother, and Father				
Elder brother served	0.0338**	0.0304*	0.0420**	0.0865**
	(0.0161)	(0.0170)	(0.0201)	(0.0337)
	[0.0060, 0.06122]	[0.0012, 0.0604]	[0.0077, 0.0754]	[0.02700, 0.1400]
F-stat. excl. inst.	3,982	3,611	2,540	890
Mean of dep. var.	0.424	0.419	0.414	0.423
Observations	12,019	10,750	8,027	3,016
Panel B: With Elder Brother				
Elder brother served	0.0310**	0.0240	0.0331*	0.0594**
	(0.0156)	(0.0158)	(0.0179)	(0.0284)
	[0.0053, 0.0569]	[–0.0041, 0.0492]	[0.0021, 0.0624]	[0.0145, 0.1067]
F-stat. excl. inst.	4,250	4,146	3,190	1,239
Mean of dep. var.	0.427	0.427	0.424	0.431
Observations	12,909	12,512	9,947	3,957
Panel C: With Father				
Elder brother served	0.0357**	0.0303*	0.0416**	0.0467**
	(0.0160)	(0.0167)	(0.0177)	(0.0182)
	[0.0083, 0.0614]	[0.0023, 0.0571]	[0.0149, 0.0732]	[0.0157, 0.0747]
F-stat. excl. inst.	4,044	3,712	3,309	3,141
Mean of dep. var.	0.424	0.420	0.416	0.417
Observations	12,220	11,117	10,119	9,545

Notes: Robust standard errors in parentheses and 95 percent confidence intervals in brackets. *$p < 0.10$, **$p < 0.05$, ***$p < 0.010$. The table presents IV estimates of service spillovers from 12 separate regressions for different samples split by family time spent together. Panels distinguish different groups of family members, and columns indicate number of years each family group has spent together while the younger brother is aged 4–17. The specification is the same as in Table 3, Panel D, Column 4.

D. Compliers Analysis of Selection and Causation

In this subsection, to help understand our main IV estimates based on fit-for-service brother pairs presented in Table 3, we conduct compliers analyses describing *who* responds to the assignment to serve in Table 12 and *how* younger brothers respond to elder brother service in Table 13.[46] While we can observe 7 percent of a cohort

46. Angrist, Imbens, and Rubin (1996) discuss the assumptions required for a LATE interpretation of IV estimates by distinguishing four response types relative to assignment to a treatment. First, when told what to do, some individuals will always comply ("compliers"). Second, in contrast, some will always do the opposite

Table 10
Spillovers by Height Relative to Median

	Elder Above Younger Above (1)	Elder Above Younger Below (2)	Elder Below Younger Above (3)	Elder Below Younger Below (4)	Elder Below Younger All (5)	Elder All Younger Above (6)
Elder brother served	0.0346	–0.0166	0.0973***	0.0224	0.0488**	0.0549**
	(0.0283)	(0.0380)	(0.0366)	(0.0256)	(0.0211)	(0.0224)
	[–0.0208, 0.0899]	[–0.0911, 0.0578]	[0.0254, 0.1690]	[–0.0276, 0.0725]	[0.0074, 0.0960]	[0.0110, 0.0987]
F-stat. excl. inst.	1,237	705	761	1,541	2,328	2,034
Mean of dep. var.	0.427	0.449	0.412	0.426	0.422	0.422
Observations	4,271	2,118	2,181	4,554	6,735	6,452

Notes: Robust standard errors in parentheses and 95 percent confidence intervals in brackets. *$p < 0.10$, **$p < 0.05$, ***$p < 0.010$. The table presents IV estimates of service spillovers from six separate regressions for different samples split by brothers' height relative to the median. The specification is the same as in Table 3, Panel D, Column 4. After adjusting significance levels for multiple comparisons by applying the generalized adaptive linear step-up procedure described in Benjamini, Krieger, and Yekutieli (2006) (definition 2), we find Columns 3 and 6 to be significant, with a 5 percent false discovery rate the expected proportion of type 2 errors and Column 5 to be significant, with a 10 percent false discovery rate.

Table 11
Spillovers by AFQT Score Relative to Median

	Elder Above Younger Above (1)	Elder Above Younger Below (2)	Elder Below Younger Above (3)	Elder Below Younger Below (4)	Elder Below Younger All (5)	Elder All Younger Above (6)
Elder brother served	0.0421	0.0735*	0.0330	0.00258	0.0145	0.0420*
	(0.0276)	(0.0383)	(0.0343)	(0.0274)	(0.0213)	(0.0215)
	[–0.0119, 0.0961]	[–0.0015, 0.1485]	[–0.0341, 0.1001]	[–0.0510, 0.0561]	[–0.0273, 0.0563]	[–0.0001, 0.0841]
F-stat. excl. inst.	1,343	665	882	1,344	2,265	2,255
Mean of dep. var.	0.406	0.422	0.429	0.448	0.441	0.415
Observations	3,794	2,289	2,504	4,537	7,041	6,298

Notes: Robust standard errors in parentheses and 95 percent confidence intervals in brackets. $^{*}p<0.10$, $^{**}p<0.05$, $^{***}p<0.010$. The table presents IV estimates of service spillovers from six separate regressions for different samples split by brothers' AFQT scores relative to the median. The specification is the same as in Table 3, Panel D, Column 4.

Table 12
Compliers Analysis—Expectations of Background Characteristics by Elder Brother Response Type

	Always-Takers (1)	Compliers, Served = 1 (2)	Compliers, Served = 0 (3)	Never-Takers (4)	Select-In (1)–(2) (5)	Select-Out (4)–(3) (6)	IV (2)–(3) (7)
Panel A: Common Family Characteristics							
Sibling count	2.776	2.833	2.777	2.813	–0.0565	0.0360	0.0553
	(0.0262)	(0.0240)	(0.0248)	(0.0278)	(0.0418)	(0.0470)	(0.0345)
Mother schooling	11.62	11.89	11.96	11.91	–0.2667**	–0.0485	–0.0654
	(0.0713)	(0.0762)	(0.0638)	(0.0782)	(0.1267)	(0.1251)	(0.1006)
Birth spacing	3.1253	3.1913	3.0948	3.1057	–0.0659	0.0108	0.0964**
	(0.0344)	(0.0331)	(0.0296)	(0.0347)	(0.0584)	(0.0579)	(0.0458)
Panel B: Elder Brother Characteristics							
AFQT score	45.41	45.67	45.97	45.12	–0.2607	–0.8532**	–0.3015
	(0.1672)	(0.1872)	(0.1963)	(0.2540)	(0.2829)	(0.4052)	(0.2761)
Height	180.86	179.98	180.28	180.43	0.8777***	0.1492	–0.2969
	(0.1502)	(0.1529)	(0.1548)	(0.1912)	(0.2538)	(0.3054)	(0.2208)
Income at 15	122.62	123.39	126.69	124.73	–0.7660	–1.9653	–3.3048**
	(1.2462)	(1.2782)	(1.1057)	(1.5493)	(2.0730)	(2.3668)	(1.6256)
Birth weight	3.281	3.256	3.320	3.284	0.0248	–0.0353	–0.0632***
	(0.0159)	(0.0160)	(0.0146)	(0.0201)	(0.0279)	(0.0304)	(0.0221)

(*continued*)

Table 12 (*continued*)

	Always-Takers (1)	Compliers, Served = 1 (2)	Compliers, Served = 0 (3)	Never-Takers (4)	Select-In (1)–(2) (5)	Select-Out (4)–(3) (6)	IV (2)–(3) (7)
Panel C: Younger Brother Characteristics							
AFQT score	44.40	45.11	45.13	45.00	−0.7111***	−0.1302	−0.0187
	(0.1828)	(0.1808)	(0.1769)	(0.2215)	(0.2936)	(0.3575)	(0.2691)
Height	180.67	180.31	180.35	180.52	0.3575	0.1713	−0.0369
	(0.1657)	(0.1599)	(0.1329)	(0.1584)	(0.2786)	(0.2555)	(0.2001)
Income at 15	133.52	135.75	138.61	138.55	−2.2295	−0.0633	−2.8594
	(1.3976)	(1.6516)	(1.4613)	(1.6857)	(2.5200)	(2.7869)	(2.1895)
Birth weight	3.526	3.563	3.565	3.547	−0.0372	−0.0171	−0.0014
	(0.0152)	(0.0146)	(0.0126)	(0.0147)	(0.0260)	(0.0235)	(0.0192)
Observations	2,858	2,907	3,977	3,382	5,765	7,359	6,884

Notes: Robust standard errors in parentheses. $*p < 0.10$, $**p < 0.05$, $***p < 0.010$. The table presents estimates of background characteristics by elder brother response type in Columns 1-4. Columns 5–7 present differences in characteristics between elder brother response types. Panels differ according to type of characteristics being described. Calculations follow Imbens and Rubin (1997) and are presented in Online Appendix B. Estimates are not conditioned on covariates.

Table 13
Compliers Analysis—Expected Younger Brother Response by Elder Brother Response Type

	Always-Takers (1)	Compliers, Served = 1 (2)	Compliers, Served = 0 (3)	Never-Takers (4)	Select-In (1)–(2) (5)	Select-Out (4)–(3) (6)	IV (2)–(3) (7)
Panel A: Younger Brother Service and Draft Status							
Served = 1	0.5305	0.4226	0.3939	0.3844	0.1079***	–0.0095	0.0286**
	(0.0132)	(0.0110)	(0.0115)	(0.0142)	(0.0202)	(0.0235)	(0.0138)
Drafted = 0, served = 0	0.3809	0.4572	0.4648	0.4663	–0.0762***	0.0015	–0.0076
	(0.0125)	(0.0118)	(0.0110)	(0.0135)	(0.0200)	(0.0226)	(0.0167)
Drafted = 0, served = 1	0.186	0.0976	0.084	0.1036	0.0889***	0.0195*	0.0135
	(0.0091)	(0.0087)	(0.0065)	(0.0071)	(0.0150)	(0.0117)	(0.0104)
Drafted = 1, served = 0	0.0884	0.1201	0.1411	0.1491	–0.0317***	0.0079	–0.0210**
	(0.0064)	(0.0065)	(0.0067)	(0.0082)	(0.0106)	(0.0128)	(0.0091)
Drafted = 1, served = 1	0.3440	0.3249	0.3098	0.2808	0.0190	–0.0290	0.0151
	(0.0114)	(0.0105)	(0.0101)	(0.0109)	(0.0100)	(0.0185)	(0.0145)

(*continued*)

Table 13 (*continued*)

	Always-Takers (1)	Compliers, Served = 1 (2)	Compliers, Served = 0 (3)	Never-Takers (4)	Select-In (1)–(2) (5)	Select-Out (4)–(3) (6)	IV (2)–(3) (7)
Panel B: Younger Brother Response Type							
Always-takers	0.3287	0.1759	0.1532	0.1818	0.1527***	0.0286	0.0227
	(0.0154)	(0.0140)	(0.0116)	(0.0140)	(0.0251)	(0.0234)	(0.0170)
Compliers, served = 1	0.2018	0.2466	0.2407	0.2026	–0.0447***	–0.0381*	0.0059
	(0.0107)	(0.0120)	(0.0109)	(0.0117)	(0.0187)	(0.0199)	(0.0162)
Compliers, served = 0	0.2649	0.3074	0.2929	0.2686	–0.0425***	–0.0243	0.0144
	(0.0121)	(0.0124)	(0.0127)	(0.0138)	(0.0191)	(0.0239)	(0.0181)
Never-takers	0.2044	0.2699	0.3130	0.3469	–0.0654***	0.0338	–0.0431**
	(0.0158)	(0.0138)	(0.0166)	(0.0184)	(0.0233)	(0.0317)	(0.0215)
Observations	2,858	2,907	3,977	3,382	5,765	7,359	6,884

Notes: Robust standard errors in parentheses. *$p < 0.10$, **$p < 0.05$, ***$p < 0.010$. The table presents estimates of younger brother responses conditional on elder brother response type in Columns 1–4. Columns 5–7 present differences in younger brother responses between elder brother response types. Panels differ according to whether younger brother service and draft status, or younger brother response types, are being described. Calculations in Panel A follow Imbens and Rubin (1997), and calculations in Panel B extend the Imbens and Rubin (1997) framework to the case of double random assignment. Calculations are presented in Online Appendix B. Estimates are not conditioned on covariates.

volunteering for the military because they serve but were not drafted, we are unable to observe those who would have volunteered had they not been drafted. Assuming there are no defiers, we can infer that 15 percent of a cohort serve because they were drafted but otherwise would not have volunteered.[47] While the 27 percent rate of service in Denmark is higher than the 4–26 percent in the U.S. Vietnam era (Angrist 1990), it is lower than the 40 percent of the Netherlands (Hubers and Webbink 2015). Nevertheless, because of the high compliance rate in Denmark, our LATE is relevant for half the men who serve.

Although we cannot always identify individual response type, we can characterize response groups of fit-for-service men as mixtures of compliers and noncompliers (Imbens and Rubin 1997). Table 12, Columns 1–4 show estimates of background characteristics for each elder brother response type. Panel A describes common family characteristics, and Panels B and C describe elder and younger brother characteristics, respectively. Differences in characteristics are small across response types.

The IV estimates are based on differences in service status among compliers. Table 12, Column 7 presents differences in background characteristics for compliers who serve minus compliers who do not serve. Elder brother compliers are more likely to serve if they have lower household income at 15, lower birth weight, and wider birth spacing. However, all differences in response type characteristics are small, at 2–3 percent of the mean, suggesting that particular groups are not driving our IV estimates of service spillovers.

The IV estimates compare compliers who serve with compliers who do not serve, whereas OLS estimates also include always-takers and never-takers. To identify the sources of the OLS bias, we compare differences in combinations of response types. Taking the difference between always-takers and compliers who serve, Table 12, Column 5 describes the family characteristics for elder brothers who *select into* service. We can see selection into service for the elder brother is associated with low maternal schooling, a tall elder brother, and a younger brother with a low AFQT score. Similarly, Table 12, Column 6 takes the difference between never-takers and compliers who did not serve to describe family characteristics for elder brothers who *select out* of service. We can see that elder brothers who select out of service have low AFQT scores.

Because the younger brother is also randomly assigned to service, we have the unique opportunity of identifying the behavioral mechanism behind younger brothers' response to elder brother service. We can examine whether the younger brother is more likely to comply with being drafted, is more likely to select into service (to be an always-taker), or is less likely to select out of service (to be a never-taker). While in Table 12 we describe who responds, in Table 13 we describe how the younger brother responds.[48]

Panel A of Table 13 presents estimates of expected younger brother service and draft status, conditional on elder brother response type. The top line of Panel A shows

("defiers"). Third, regardless of the instructions, some will always receive the treatment ("always-takers"). Fourth, regardless of instructions, some will never receive the treatment ("never-takers").

47. The fraction of men not serving among those who are drafted estimates the population share of never-takers (27 percent). The fraction of men who serve among those who are fit-for-service and not drafted estimates the population share of always-takers (21 percent). The remaining 52 percent of fit-for-service men are compliers. Because 28 percent of a cohort are drafted, and 52 percent of these men are compliers, we can calculate that 15 percent of a cohort serve because they were drafted.

48. All of these statistics by elder brother response types are derived from Imbens and Rubin (1997) and are applied to our context and extended as shown in Online Appendix B.

expected younger brother service is highest for elder brothers who are always-takers and lowest for elder brothers who are never-takers, illustrating the importance of the selection effects biasing OLS estimates. Decomposing the selection effect in Table 13, Columns 5 and 6 of Panel A shows that elder brother selection into the military explains all of the OLS bias. From Table 13, Column 7 of Panel A we can see that the effect of elder brother service on younger brother service comes from fewer younger brothers who are drafted but do not serve.[49]

Panel B of Table 13 estimates younger brother response type conditional on elder brother response type. Decomposing the selection effect in Columns 5 and 6 shows that OLS bias from elder brother selection into the military is overwhelmingly due to more younger brothers who are always-takers. From Column 7 of Panel B we can see that the effect of elder brother service on younger brother service comes from fewer younger brothers being never-takers.

Thus, the double random assignment of brother pairs to military service allows us to show the behavioral mechanisms of *younger* brother responses. Under a mixed conscription and volunteer force, while elder brothers selecting into service are more likely to have younger brothers who are always-takers, the recruitment base is broadened further by behavioral spillovers encouraging younger brother service by reducing younger brother likelihood of being never-takers.

E. Industry of Employment

While serving in the military, men gain specific skills and work experience through the training they undertake and the tasks they perform.[50] Given their exposure to this particular occupation, they might follow a different work career than they otherwise would have. In this subsection, we measure how military service affects subsequent industry of employment.

We select the 200 industries employing the most men from our sample of all fit-for-service men born 1976–1983.[51] We run three sets of IV regressions explaining binary indicators for industry affiliation. First, for all fit-for-service men we explain their industry by their service status instrumented by their draft status. Second, we explain elder brother industry by elder brother service instrumented with elder brother draft. Third, we look for spillovers by explaining younger brother industry by elder brother service instrumented with elder brother draft. Table 14 shows results for the ten most significant estimates from each set of regressions, while Figure A.1 in the Online Appendix presents the distributions of all estimates.

After adjusting for false discovery rates (Benjamini, Krieger, and Yekutieli 2006), we find that service significantly affects the probability of employment in ten industries for all fit-for-service men in Panel A of Table 14 and affects only one industry for elder

49. The IV estimate in Table 3, Column 1, Panel D is different from the IV estimate in Table 13, Column 7, top row because the former includes younger brother draft status as a covariate in the regression.

50. Conscripts undergo basic military training. They also acquire some skills that will enable them to support the emergency services and provide help to civil society. They are also trained in fire-fighting and introduced to peace-supporting operations. While the training includes weapons handling, marksmanship, and combat activities, training is wide and varied (that is, not necessarily focusing on combat), and it also varies by branch (army, navy, air force) and corps function (for example, infantry, tanks, engineering, artillery).

51. For each man we choose the industry with the longest employment from the year after he completed military service. See the Online Appendix for the list of industries selected (Online Appendix Table A.12).

Table 14

IV Estimates of Service Effects on Industry

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A: Full Sample of Fit-for-Service Men. Outcome: Own Industry										
Industry	defense	plumber	electrician	radio and TV retail	shipping	car sales	pig breeding	university	hotels restaurants	technical college
Own service = 1	0.114***	–0.00559***	–0.00770***	–0.00353***	–0.00298***	–0.00592***	–0.00294***	–0.00233***	–0.00306***	–0.00123***
	(0.00301)	(0.00115)	(0.00160)	(0.000787)	(0.000674)	(0.00135)	(0.000742)	(0.000613)	(0.000818)	(0.000339)
Sum of dep. var.	13908	1700	3395	789	577	2357	701	480	853	146
Panel B: Sample Two Brothers Fit for Service. Outcome: Elder Brother Industry										
Industry	defense	home help	wood construction	restaurant	furniture factory	housing corporation	masonry	plant nursery	furniture store	greengrocer wholesale
Elder served = 1	0.130***	–0.00380	–0.00669	–0.0105	–0.00722	–0.00251	–0.00193	–0.00673	0.00454	–0.00243
	(0.0105)	(0.00120)	(0.00244)	(0.00401)	(0.00303)	(0.00115)	(0.000905)	(0.00317)	(0.00219)	(0.00120)
Sum of dep. var.	1353	14	58	159	90	13	8	99	47	14
Panel C: Sample Two Brothers Fit for Service. Outcome: Younger Brother Industry										
Industry	communications store	real estate	windmill manufacture	marketing	meat processing	gas station	care spares manufacture	temp work agency	machinery metalwork	fire and rescue
Elder served = 1	0.00308	–0.00295	0.00464	0.00537	–0.00218	–0.00943	0.00233	0.0125	–0.00167	–0.00188
	(0.00111)	(0.00106)	(0.00184)	(0.00220)	(0.000907)	(0.00433)	(0.00115)	(0.00631)	(0.000848)	(0.00101)
Sum of dep. var.	12	11	33	47	8	185	13	401	7	10

Notes: Standard errors in parentheses. *$q < 0.10$, **$q < 0.05$, ***$q < 0.010$, where q is the false discovery rate, the expected proportion of type 2 errors. The table presents estimates from separate IV regressions, explaining binary indicators for industry employment with a binary indicator for military service. Panels A and B use different samples of men and explain industry with their own service, whereas Panel C explains younger brother industry with elder brother service. Regressions include the same controls as in Table 3, Panel D, Column 4. Of the 200 industries considered, the table only presents estimates for the most significant ten in each panel. We present q-values rather than p-values to adjust for multiple comparisons and apply the generalized adaptive linear step-up procedure described in Benjamini, Krieger, and Yekutieli (2006) (definition 2) to all 200 industries. Distributions of all estimates and p-values are presented in the Online Appendix. F-statistics for excluded instruments (numbers of observations) are 47,681 (152,234), 4,336 (13,124), and 4,322 (13,124) for Panels A, B, and C, respectively. Without adjusting for multiple hypotheses, service effects are significant at the 5 percent level for 41, 11, and 9 industries for Panels A, B, and C, respectively.

brothers in Panel B. Panels A and B show estimates for their service effects on their industry, suggesting that statistical power is lacking for our brothers sample (Panel B), which represent less than 10 percent of fit-for-service men in these cohorts (Panel A).

Panel C presents estimates of *spillovers* from elder brother service to younger brother industry, with no industries being significant. Neither do we find an effect of younger brother serving on younger brother's industry (not shown). Both the size of the sample and our observing fewer post-service years for younger brothers compared to the elder brothers can explain these insignificant findings.

F. Extensions to More Siblings

Our analysis so far has focused on spillovers from elder to younger brother for the first two maternal brothers born 1976–1983, and we have ignored the influence of other siblings. While Section C illustrates some spillover mechanisms by allowing effects to vary with characteristics of the focal brother pair, this final subsection illustrates some spillover dynamics by allowing effects to vary with sibling composition. First, we split the sample by the presence of other brothers and sisters. Second, we focus on families with more than two brothers, regardless of fitness. Third, we extend our analysis to spillovers among three brothers who are all fit for service.

Table 15 presents IV estimates of the effect of elder brother service on younger brother service split by the presence of siblings.[52] Panel A shows that spillovers are higher when there are other siblings, although when we only count other siblings born in the same 1976–1983 cohort window, the point estimate becomes insignificant. Panels B and C split the sample by the presence of sisters and brothers, and reveal opposing effects by sibling gender, effects obscured in Panel A when we pooled brothers and sisters. When there are sisters, spillovers become insignificant. When there are more than two brothers, spillovers become larger, and when we count only other brothers born in the same cohort window, spillovers become larger still—three times as large as for the full sample. While spillover differences are insignificant, spillovers are clearly driven by families with more than two brothers and no sisters.

In Table 16 we consider only families with more than two brothers.[53] Column 1 in Table 16 corresponds to Panel C, Column 2 in Table 15, and the remaining columns in Table 16 further restrict this sample. When our two brothers of interest are born less than three years apart, spillovers are larger. Further restricting to three brothers born within our eight-cohort window increases the spillover to 17 percentage points (36 percent at the mean). The presence of a third brother outweighs any opposing effect of sisters in Table 15. Considering households without sisters, where three brothers are born 1976–1983, gives a similarly high spillover.

Finally, imposing all of our restrictions, by further requiring that our two brothers of interest are also born within three years of one another, gives a spillover of 26 percentage points (55 percent at the mean), seven times that of the full sample. While point estimates are high, standard errors also increase for these restricted samples, and the estimates are not significantly different from one another. Nevertheless, the point estimates make clear that spillovers are driven by brothers who are closer.

52. Online Appendix Table A.13 presents OLS estimates corresponding to the IV estimates in Table 15.

53. Online Appendix Table A.14 presents OLS estimates corresponding to the IV estimates in Table 16.

Table 15
Spillovers Split by Presence of Other Siblings

	Born 1976–1983 (1)	Any (2)	None (3)
Panel A: Other Siblings			
Elder brother service	0.0564	0.0396**	0.0286
	(0.0363)	(0.0193)	(0.0213)
	[–0.0055, 0.1173]	[0.0107, 0.0688]	[–0.0061, 0.0640]
F-stat. excl. inst.	754	2,670	2,168
Mean of dep. var.	0.446	0.434	0.433
Observations	2,112	6,977	6,147
Panel B: Sisters			
Elder brother service	0.00912	0.0207	0.0397**
	(0.0452)	(0.0250)	(0.0175)
	[0.0635, 0.0805]	[–0.0197, 0.0635]	[0.0111, 0.0664]
F-stat. excl. inst.	479	1,570	3,276
Mean of dep. var.	0.437	0.434	0.433
Observations	1,383	4,259	8,865
Panel C: Other Brothers			
Elder brother service	0.113**	0.0514**	0.0245
	(0.0566)	(0.0249)	(0.0175)
	[0.0170, 0.2003]	[0.0085, 0.0918]	[–0.0045, 0.0519]
F-stat. excl. inst.	303	1,584	3,243
Mean of dep. var.	0.466	0.436	0.432
Observations	839	4,054	9,070

Notes: Robust standard errors in parentheses and 95 percent confidence intervals in brackets. *$p < 0.10$, **$p < 0.05$, ***$p < 0.010$. The table presents IV estimates of service spillovers from nine separate regressions for different samples split by the presence of other siblings. Column 1 samples only brother pairs with another sibling born in the same 1976–1983 cohort window. Column 2 samples brother pairs with another sibling born anytime before the younger brother turns 18. Column 3 samples brother pairs with no other siblings born before the younger brother turns 18. Panel A considers siblings of any gender, Panel B considers sisters, and Panel C considers other brothers. The specification is the same as in Table 3, Panel D, Column 4.

Understanding the social multiplier is a key motivation for studying social interactions. Although our setting of an elder brother affecting a younger brother helps identification by avoiding the reflection problem, with only two brothers and directed social links we cannot identify a social multiplier. The presence and composition of other siblings in the household clearly influences spillovers between our two brothers. We can go beyond this observation by modeling spillovers within three-brother households, where social links are still directed, and while we cannot identify a social multiplier, we allow several elder brothers to affect younger brothers.

Table 16

Spillovers in Families with More Than Two Brothers

	(1)	(2)	(3)	(4)	(5)
Sisters	Yes/No	Yes/No	Yes/No	No	No
Three brothers 1976–1983	Yes/No	Yes/No	Yes	Yes	Yes
Under 36 months spacing	Yes/No	Yes	Yes	Yes/No	Yes
Elder brother service	0.0514**	0.0761**	0.169**	0.161**	0.262**
	(0.0249)	(0.0345)	(0.0818)	(0.0733)	(0.107)
	[0.0112, 0.0942]	[0.0221, 0.1336]	[0.0313, 0.3069]	[0.0302, 0.2925]	[0.0599, 0.4424]
F-stat. excl. inst.	1,584	783	139	185	80
Mean of dep. var.	0.436	0.435	0.470	0.479	0.479
Observations	4054	2295	513	549	351

Notes: Robust standard errors in parentheses and 95 percent confidence intervals in brackets. *$p < 0.10$, **$p < 0.05$, ***$p < 0.010$. The table presents IV estimates of service spillovers from five separate regressions for different samples of families with more than two brothers, split by additional sample restrictions. Column headers indicate whether the restriction is imposed (yes), reversed (no), or ignored (yes/no). The specification is the same as in Table 3, Panel D, Column 4.

Table 17
Spillovers between Three Brothers

	Elder Brother Explains Younger				Placebo—Younger Explains Elder			
	Middle Served (1)	Youngest Served (2)	Youngest Served (3)	Youngest Served (4)	Middle Served (5)	Eldest Served (6)	Eldest Served (7)	Eldest Served (8)
Eldest served	0.217**	–0.0233	–0.00192					
	(0.0896)	(0.0876)	(0.0820)					
	[0.0411, 0.3922]	[–0.1950, 0.1483]	[–0.1625, 0.1587]					
Middle served			0.227**	0.188*			–0.147	–0.0969
			(0.110)	(0.107)			(0.106)	(0.103)
			[0.0110, 0.4430]	[–0.0214, 0.3967]			[–0.2480, 0.1205]	[–0.2991, 0.1053]
Youngest served					0.0358	–0.0584	–0.0638	
					(0.112)	(0.0838)	(0.0940)	
					[–0.1830, 0.2546]	[–0.2226, 0.1058]	[–0.3547, 0.0599]	
F-stat. excl. instr.	121	137	27	63	64	64	20	57
Mean of dep. var.	0.460	0.481	0.481	0.481	0.460	0.504	0.504	0.504
Observations	335	335	335	335	335	335	335	335

Notes: Robust standard errors in parentheses and 95 percent confidence intervals in brackets. $*p<0.10$, $**p<0.05$, $***p<0.010$. For a sample of three brothers born 1976–1983 and assessed as fit for service, the table presents estimates from eight separate IV regressions. The column headers indicate for which family member service status is being modeled. Either elder brother's service explains younger brother service in Columns 1–4, or younger brother's service explains elder brother service in placebo regressions in Columns 5–8. The specification for Columns 1–4 is the same as in Table 3, Panel D, Column 4, extended for two endogenous variables for column 3. The specification for Columns 5–8 is the same as in Table 6, Panel D, Column 4, extended for two endogenous variables for Column 7. The family is the unit of observation in each regression we explain only one family member's service status as a function of (one or more) other family member(s) service status so clustering at the family level is superfluous.

In our main sample we selected the first two brothers who are fit for service and born 1976–1983. However, 335 of these brother pairs have an even younger brother born within the same window, a brother who is fit for service but was previously excluded from our estimation sample. Extending the analysis to these 335 sets of three fit-for-service brothers, we can examine which brother is influenced by whom and how far the influences run in the family.

Table 17 presents IV estimates of spillovers among three brothers who are all fit for service.[54] Each regression explains one brother's service status with the service status of either one or both of his other brothers. Regressions are run separately for each type of focal brother, and each family appears only once in each regression. Columns 1–4 show elder brothers' service explaining younger brothers' service; Columns 5–8 show placebo estimates of younger brothers' service explaining elder brothers' service. Eldest brother service has a very large effect on middle brother service, an effect that is six times larger than for first two brothers in general, but with wide confidence bounds. Spillovers from middle to youngest brother are similarly large, but are significant only when we also instrument for eldest brother service. Placebo estimates of reverse causation are insignificant for all combinations.

The results show that sisters reduce spillovers in military service between brothers, whereas additional brothers reinforce spillovers, especially if the brothers are closely spaced. In combination, these additional sibling spacing and gender restrictions can increase the spillovers between the first two fit-for-service brothers to 55 percent at the mean, compared to 7 percent for the full sample. For families of three fit-for-service brothers, spillovers at the mean are 47 percent from eldest to middle brother and from middle to youngest.

Our range of spillover estimates are closer to those found in other sibling studies, such as the 27 percent effect found by Dahl, Loken, and Mogstad (2014) for brother spillover in Norwegian paternity leave participation, than the father-to-son spillover effect in U.S. wartime military service of 88 percent found by Campante and Yanagizawa-Drott (2015), or the 145 percent parent-to-child spillover effect in Norwegian disability insurance participation found by Dahl, Kostøl, and Mogstad (2014). That our estimates are much lower than those from the other random assignment study (Dahl, Kostøl, and Mogstad 2014) could be because military service is a much bigger program than disability insurance, with more information publicly available, and we speculate that there is less scope for transfer of private information through the family.

VI. Conclusion

Estimating the effects of social interactions is notoriously difficult. For family interactions, the key challenge is to separate within-family similarities caused by shared but unobserved factors and family members influencing one another. Consequently, very few studies provide causal estimates of family spillovers. We

54. For the sample of three fit-for-service brothers, Online Appendix Table A.15 presents descriptive statistics, and Online Appendix Table A.16 presents a balancing check for draft random assignment.

add to this literature by using elder brothers who are randomly assigned to military service and younger brothers who, while also randomly assigned, may be noncompliant (either by volunteering or by refusing to serve if drafted). In this setting, we can clearly identify the causal effects of elder brother service on younger brother service.

Our results suggest that having an elder brother serving in the military increases a younger brother's probability of serving by about 7 percent. This estimate reflects the younger brother being less likely to refuse to serve because the elder brother is forced into military service. Our estimated military service spillovers are more modest than the rather large family spillovers found for participation in other programs. For families with more than two brothers, our spillovers are at the lower end of the range found by other studies. Nevertheless, even in our context of a large program with plenty of information publicly available, we find significant spillovers.

Our results have several important implications for military recruitment in particular and for program participation and interpretation of sibling correlations in general. For military recruitment, the spillovers suggest that sibling influences broaden the recruitment base in a mixed conscription and volunteer force. These findings should lead to future investigation into the type of information shared between brothers, with a view to making more widely available certain types of information that are currently shared only privately. Such information could help broaden the population base of volunteers and offers the prospect of allowing the government to reproduce this essential feature of conscription in an all-volunteer force.

The results also suggest that the common observation that military experience runs in the family partly reflects the social influence that family members have on one another. For program participation more generally, one interpretation of this result is that families can provide important private information that significantly affects behavior even in cases where a great deal of information is publicly available.

Our results also have implications for the interpretation of sibling correlations. An important part of such correlations may reflect spillover effects across siblings, in addition to reflecting the combined effects of family background and community influences on a particular outcome.

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