Siblings and Soldiers:

Family Background and Military Service

in the All-Volunteer Era*

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ABSTRACT

Several studies using surveys from the early years of the all-volunteer force (AVF) find that having more siblings increases the likelihood of serving in the military. Understanding the reasons for this sibling/soldier relationship illuminates our understanding of the functioning of families and has policy implications. Analyses are undertaken for two cohorts of the NLSY corresponding to the early and late phases of the all-volunteer era. For the early cohort, the sibling/soldier relationship is due to birth order rather than number of siblings *per se*. The likelihood of enlistment increases with birth order. For the later cohort, there is no significant effect of family size on enlistment for the later cohort, although the likelihood of enlistment increases with birth order. Gender effects reflect family stability for the early cohort and sibling role modeling for the later period. An ancillary analysis indicates that younger siblings are more likely to take risky jobs. The results are consistent with the literature on sibling effects in light of the changes in the institutional structure over the period.

I. Introduction

With a workforce of over 1.2 million, the military is the largest employer in the United States (DoD 2004). It is a unique employer in many respects. Enlistees agree to a multi-year contract that can be broken only under very unusual circumstances. Under military law, they forego certain rights enjoyed by ordinary citizens. In wartime, the risk of death exceeds that of most civilian occupations.

The relationship between the employer and the workers' families is far different than in the civilian world. Regulations prohibit individuals with more than two dependents from enlisting, yet the pay structure encourages marriage and parenthood. The military is bilaterally selective: The very rich and the very poor are unlikely to enlist. Enlistees are more likely to have graduated from high school, and less likely to have graduated college, than the general population. There is no reason to think that the pool of individuals attracted to and selected by the military to be representative in other respects.

While the literature in economics on the effect of military service on civilian outcomes recognizes the endogeneity of military service, there has been little work on the effect of family background on enlistment. This paper explores the role of one facet of family background: siblings.

One stylized fact that has emerged in the literature on the family is that individuals with fewer siblings fare better in terms of developmental, academic and social outcomes. Older siblings attain more schooling, perform better on standardized tests, and are less likely to engage in risky behaviors as adolescent (Steelman 2000, Argys et al 2006). These empirical regularities are consistent with several economic models of the family (Behrman 1996).

Numerous recent publications on sibling effects, as well as a *TIME Magazine* cover story, attest to the continuing interest in the topic among scholars and the public.[1]

Several studies report that men with more siblings are more likely to enlist in the military[2]. This "sibling/soldier" relationship is remarkably consistent among several surveys for the early all-volunteer force (AVF) era. It has implications for policy and for the theory of the family.

The focus of this paper is the effect of the number of siblings on military service. I estimate the effects with two cohorts of data: the NLSY79 corresponding to the early years of the AVF era and the NLSY79-YA corresponding to the most recent period.

What is the process through which sibling characteristics affect military service? Two explanations relates to the financing of college education. The military provides substantial educational benefits through GI Bills and other means. When parents are credit constrained, or explicitly trade off quality of children for quantity, young people from larger families will have greater need to self-finance education. Another possibility involves mortality risk aversion, with larger families having a greater capacity for tolerance of the risk of loss of a child in combat. A fourth relates to intergenerational transmission of fertility preferences. The military's family friendly compensation strategy may tend to attract those with many siblings, who in turn will want larger families themselves.

[1] Papers on sibling effects include Black et al (2006) Cáceres-Delpiano (2006) Kantarevic, Jasmin, and Stéphane Mechoulan. (2006). The *TIME* story is entitled "How your Siblings Make You Who You Are" Kluger (2006).

[2] Teachman et al,1993a, 1993b, Hosek and Peterson, 1990, and Kilburn and Klerman, 2000.

Because number of siblings and birth order are mechanically correlated, issues of birth order are relevant. If the sibling/soldier relationship reflects parity rather than sibship size *per se*, issues of allocation of resources among children (Behrman 1996) as well as child-specific heterogeneity come into play. The literature on birth order generally finds that older children perform better along many dimensions and receive preferential allocation of parents' time. The apparent effect of family size on enlistment may indicate a greater likelihood of enlistment among younger siblings, reflecting negative selection into military service. One exception to the typically preferential treatment of older siblings relates to funding college education. Parents are more likely to be credit constrained when earlier born children reach college age, therefore they contribute less to their older children's education (Steelman 2000).

I find that, for the early cohort, the apparent positive effect of number of siblings on enlistment is entirely attributable to birth order. Younger siblings are more likely to enlist than their older siblings. For the later cohort there is no significant relationship between sibship size and enlistment, but the likelihood of enlistment increases with parity. The birth order effect reversed throughout the AVF era.

This finding is entirely consistent with changes in the incentives for enlistment throughout the period. In the 1970's and early 1980's the military was plagued by quality problems resulting from the misnorming of the entrance exam, as well as low pay overall. Since then, pay increased and focus on educational benefits attracted higher quality applicants (Rostker 2006). The compensation package tended to attract older siblings with greater need to self-finance their education. The older siblings carried with them the favorable unobservables associated with their birth order.

Section II of this paper provides further background on the literature and theory. Section III outlines the empirical model and Section IV describes the data. Results are reported in Section V. Section VI concludes.

II. Background

Siblings

Behrman (1996) surveys models of intrahousehold resource allocation in which child well-being varies with family characteristics. In models of Behrman, Pollak and Taubman (BPT), predictions hinge on whether parents are constrained in the credit market. When parents are not constrained, and care only about children's outcomes rather than their education *per se*, allocation of resources to education depends only on a comparison the returns to the educational investments with the market rate of return. This result does not hold when parents are credit constrained. In this case, children will receive inefficient levels of schooling and may self-finance their education.

A second strand of the literature (most notably, Becker and Lewis, 1973; and Becker and Tomes, 1976) allows parents choose the number of children and their quality simultaneously. This model also predicts that children from larger families will receive fewer resources. Again, if children demand a greater amount of education than parents will finance, children from larger families will be disproportionately drawn into the military.

The prediction of both models - that children from larger families receive fewer resources – is an empirical regularity (Steelman 2000). They perform relatively poorly on standardized tests of developmental and academic achievement, realize lower levels of educational attainment and earn less than children from smaller families.

Modeling enlistment raises new issues. First, unlike, say, education or earnings, it is unclear whether military service is a good or bad outcome. Second, particularly in recent years, the issue of mortality risk is salient. If families with more children can be more tolerant of the risk of losing a child in combat, men with more siblings will be more apt to enlist. This is less likely to be the case for daughters, who face a lower risk of death in combat than sons. This tradeoff between number of children and mortality risk is the flip side of hoarding models of fertility (eg, Becker and Barro 1989), which posit that in environments in which child mortality is high, a precautionary motive will lead parents to have more than their desired number of children in order to protect be protected should other children die.[3]

Literatures on birth order effects have evolved in economics, sociology and child development. The most prominent line of work in economics follows the work of Behrman, Pollak and Taubman (BPT), much of which is compiled in BPT (1995).

In the BPT (1997) model of intrahousehold allocation, parents' investments in children's human capital depends children's endowments and the returns to investing in their human capital. As before, in the unconstrained case parents invest in each child up to the point in which the marginal product of the investment equals the market rate of return. One child's characteristics do not affect another's human capital or outcomes – i.e., there are no cross-

[3] DeLeire and Levy (2004) show that current family structure affects mortality risk in a model of civilian occupational choice. Consistent with risk-averting behavior, single parents are less apt to choose risky occupations than parents with partners.

sibling effects. Cross-sibling effects can arise if the parents are resource constrained, or if children's human capital or outcomes are arguments to the parents' utility functions.

Steelman's work (2000) suggests that credit constraints will bind in early stages of the parents' life-cycle, and time constraints will bind at later stages. Her dmpirical work confirms that younger siblings receive a greater share of parents' expenditures on education, while older siblings are more likely to self-finance.

Time constraints shape the family environment and, in turn, resources allocated to, and outcomes of, the children. Steelman's life-cycle model predicts that older children will enjoy more parental time. Zajonc's (1976) confluence model predicts that firstborns will realize greater academic potential because of greater exposure to adults. In Birdsall (1991) middle children have more adjacent children competing for their mother's time. [4]

Differentials in inputs, and cognitive and developmental outcomes emerge at early ages. Beginning at four years of age, firstborns in two child families receive more of their parents' quality time (Price 2006). Firstborns perform better in terms of a variety of early childhood cognitive outcomes (Heiland, 2004, Conley et al, xx) and are less likely to demonstrate behavioral problems. (Conley et al xx). Consistent with the confluence model, Hanushek (1992) reports that first-borns and lastborns in large families achieve higher reading scores by sixth grade. Rose (2007) finds that older children achieve higher PIAT and PPVT scores.

[4] In a popular book, Sulloway (1996) claims that first-borns are more conformist and more apt to identify with authority. However, this research is not without controversy (Steelman et al 2002).

Birth order effects continue into later years. Schooling declines with parity, even when controlling for number of siblings, in the United States (Behrman and Taubman 1986) and Norway (Black et al, 2005). Older siblings generally perform better on standardized academic tests (eg, Zajonc 1976, Conley Pfeiffer and Velez). Firstborns have higher IQ's (Black et al 2006). These findings are echoed in the NLSY79 and NLS79-YA data (Rose, 2007). For the early cohort, scores on the Armed Forces Qualifying Test (AFQT), education and earnings decrease in parity for some family sizes. For the later cohort, birth order effects are apparent in models of schooling and earnings, as well as the PIAT and PPVT scores.

As adolescents, younger siblings are more apt to engage in risky behaviors. They are more likely to smoke cigarettes, use marijuana, drink alcohol, steal, carry a gun and be sexually active as adolescents than their older siblings (Argys et al 2006). Black et al (2005) find that younger sisters are more apt to have a teen birth. Explanations for younger siblings' excess risk taking include older siblings' demonstrating negative roles or explicitly introducing younger siblings into these activities, as well as more lax parental supervision.

There is some evidence that birth order directly affects earnings and job characteristics. Behrman and Taubman (1986) find that earnings decline with parity, but the effect operates through schooling. Kantarevic and Mechoulan (2006) and Rose (2007), support this finding, but Kessler (1998) does not find birth order effects on earnings. Results in this paper indicate that younger siblings are more apt to engage in dangerous employment, consistent with the work of Argys et al. (2006).

Raley and Bianchi (2006) survey the literature in economics, sociology and psychology on child gender effects on the family in the US. They note only a handful of studies relating to sibling gender, all of which focus on education. Results are mixed; although the most prominent paper in economics, Butcher and Case (1994), reports that having older brothers increases women's education.[5] This is explained in terms of a demonstration effect, with the brothers modeling traditionally male roles for the sisters.

Raley and Bianchi emphasize the increased marital stability conferred on a family by sons relative to daughters (eg, Morgan et al 1988, Lundberg and Rose 2003, Dahl and Moretti 2004).[6] Because children from single-parent families fare worse in terms of a number of outcomes (McLanahan and Sandefur 1994, Ginther and Pollak 2004) child gender can have consequences for siblings. Morgan and Pollard (2002) and Lundberg and Rose (2003) find that the effects of child gender on relationship stability have dissipated with time.

Soldiers

Rostker (2006) chronicles changes in the military throughout the AVF era. In the early years, policymakers became concerned about the quality of the recruits. The problems were generally attributed to two factors. One is the misnorming of the Armed Services Vocational Aptitude Battery (ASVAB), the standard test used to screen applicants and match them with military occupations (Angrist 1998, Roster 2006). Another factor was the low pay and benefits:

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[5] Although Kaestner (1997) and Hauser and Kuo (1998) do not detect significant effects of presence of brothers.

[6] This nexus of results is consistent with greater investment in public goods, such as housing, as found by Lundberg and Rose (2004). It also reflects a greater utility from marriage for men, consistent with transfers to wives in terms of greater consumption of female goods after the birth of a boy (Lundberg and Rose 2004), or lower consumption of leisure for fathers, but not mothers, after the birth of a boy (Lundberg and Rose 2002).

> "During the mid-1970s, the Services operated with reduced recruiting budgets. At the same time, there were highly publicized reports of smaller military benefits and significant gaps in pay compared to the civilian sector. Media articles cited the hemorrhage of talent from the Services due to loss of benefits…[t]he Executive and Legislative branches of government funded major initiatives to reinvigorate the volunteer military…Military pay and benefits and recruiting resources were increased substantially in 1981, resulting in a rapid increase in the quality of accessions…" [7]

The DoD defines a "quality" recruit as one who scored category III-A or above on the AFQT and graduated from high school. Figures 1 and 2 track trends in these two outcomes. The trough in both outcomes occurred around 1978-80. Both quality measures increased until 1991. A decline since 1991 is attributed to competition from the labor market and from college, as returns to schooling increased (Warner and Asch 2001).

Issues of quality have taken on greater importance. Numerous studies in the 1980's found that higher quality enlistees performed better in several respects. Education, high school GPA and prior job stability are associated with lower attrition. High-AFQT soldiers are conducive to stronger battlefield performance and combat readiness of units. In the Navy, crews with more skilled personnel achieve shorter mission duration.

The two tools used to increase quality were higher pay and enhanced educational benefits. The feeling was that these "pull" measures generated higher quality that "push" factors such as local labor market conditions. Educational benefits included the Army College Fund in 1984, the Montgomery GI Bill in 1986 and the Navy College Fund in 1990 (Warner and Asch 2001, Roster 2006). The In-Service Voluntary Education Program, beginning in 1999, and expanded in 2003 subsidizes

[7] *Population Representation in the Military Services* (2004). "Accessions" are additions to the force.

internet college classes. Those who utilized these benefits realized higher promotion and retention rates (Boessel and Joynson 1988). According to DoD 2004: "Investment in continuing education is a sound one."

The military has become increasingly family friendly. Military health benefits are more comprehensive than in the civilian sector. Beginning in 1979, the pay schedule allowed supplemental compensation to deployed men with families. In the 1980's the Army began to provide subsidized child care, and established family support networks at the time of the Gulf War.[8]

The scope for involvement of women has increased. The proportion of women grew over 2% in 1973 to 15 percent in 2004. Numerous military occupations have opened up since 1973. At this point women are banned only from direct ground combat.

And since 2001 the country has been in a "long war" (DoD 2006).

Siblings and Soldiers

There are four models that predict the sibling-soldier relationship: (1) credit constraints, (2) quantity/quality, (3) mortality risk aversion and (4) intergenerational transmission of fertility preferences. Including birth order effects raises three additional models: (5) birth-order specific credit constraints, (6) heterogeneity in preferences for risk and (7) heterogeneity in quality. These models are not mutually exclusive and the analysis is

[8] The proportion of active enlisted personnel who are married has ranged from 40 percent in 1973 to over 57 percent in 1994.

not designed to establish clear tests to distinguish among the hypotheses. However, aspects of the change in institutional structure throughout the course of the AVF era make it possible to evaluate these explanations.

Because educational benefits were enhanced throughout the AVF era, simple versions of the credit constraints (1), or quantity/quality (2) models predict that the effect of sibship size on enlistment will be larger for the later cohort, To the extent that credit constraints are more likely to bind for older children, who are born when parents are younger, allowing for birth order specific credit constraints (5), suggests that older siblings will be more likely to enlist than younger siblings, particularly for the later cohort.

The country has been at war for much of the period spanned by the later cohort. Therefore, under the mortality risk model (3) the sibling-soldier relationship will be stronger for the later cohort. The model also predicts that the relationship will also be stronger than men than women, who face a lower risk of death.[9] The greater focus on family in the later period suggests that any sibling-soldier effect due to heterogeneity in fertility preferences (4) will also be stronger in the later cohort.

Because risk-taking behavior is more common among younger siblings and birth order and sibship size are positively correlated, the sibling/soldier relationship may reflect stronger preferences toward risk among younger siblings (6). This relationship would also be stronger in the later cohort.

[9]About 15 percent of the armed forces are women. As of May 2005, about 2 percent of the1,841 deaths and of the 12,658 wounded in the wars in Afghanistan and Iraq were women.

Finally, children from larger families, and older siblings, tend to be higher "quality" in several dimensions (2), (7). The sibling/soldier relationship may be the result of selection into military service on the basis of quality. The pull factors in the early years draw in low-quality younger siblings, and push factors in the later years draw in higher quality older sibs. To the extent that the analysis controls for observable dimensions of quality such as education and AFQT scores, what is unobservable to the researcher, and reflected in number of siblings, is also unobservable to the recruiter.

There are two countervailing effects of sibling gender. On one hand, since brothers model traditionally male roles for their younger sisters, women with brothers will be more apt to enlist. On the other hand, various studies show that individuals from unstable homes are more likely to enlist in the military (Woodruff, Kelty and Segal, 2006), and parents' relationships have been shown to be more stable if they have sons relative to daughters. Combining the effect of child gender on marital stability and the effect of stability on enlistment suggests a negative effect of brothers on military service. As the effect of brothers on marital stability is declining over time, we would expect that, on net, the difference between the number of brothers and the number of sisters will become increasingly positive.

The predictions are outlined in Table 1.

III. Estimation

The effects of siblings on military enlistment are estimated as probit model of the likelihood of having served in the military. The latent variable associated with the propensity to enlist, P*, depends on a set of sibling characteristics, X, and control variables, Z:

$$P^*_i = \alpha + X_i\beta + Z_i\gamma + \varepsilon_i \qquad (1)$$

Five different specifications of equation (1), (S1) through (S5) correspond to different specifications of the sibling variables in X. (S1) through (S3) use the number of siblings, birth order, and the difference between brothers and sisters, respectively. (S4) allows for all three effects, by including the number of older brothers and older sisters, and younger brothers and younger sisters.[10]

Because number of siblings and birth order are positive correlated, a positive coefficient on number of siblings could reflect purely a positive association between sibship size and parity (Olneck and Bills 1979, Black et al 2006). Alternatively, a negative or insignificant effect of family size would not necessarily mean that the number of siblings does not increase the likelihood of enlistment; it could be that the true effect is masked by a negative relationship between family size and parity. Specification (S5) is a general specification from which the two effects can be distinguished. It includes a set of nine dummy variables of the form Sib(i)_(k) which indicate that the respondent is parity (i) of (k) siblings. So, Sib(1)_(3) is the first child of three siblings and Sib(2)_(3) is the second child of three siblings. Subscript "j" indicates more than three; i.e.., Sib(1)_(j) indicates the first sibling of more than three, and Sib(j)_(j) indicates parity greater than 3 in a family size greater than 3. The omitted category is only children: Sib(1)_(1).

[10] One limitation of this model is that it does not allow for right censoring which is inherent in this problem. In the later sample, older siblings have had more opportunity to enlist. The empirical models have been estimated as Cox proportional hazard models, which allow for right censoring. The qualitative results were similar. Subsequent versions of this papers will report hazard estimates, and probit results can be reported as marginal effects rather than coefficients.

It is possible to test for family size effects by comparing siblings of the same parity across family size. For instance, a test of whether the effect of being the oldest child differs by family size is a test of Sib(1)_(2) = Sib(1)_(3) = Sib(1)_(j) = 0. A test of whether birth order matters in a three child family is a test of Sib(1)_(3) = Sib(2)_(3) = Sib(3)_(3).

The models are estimated for men and women individually. In order to test for significant gender differences in the effects of the sibling variables on enlistment, model (1) is estimated with pooled data, including a dummy for "male" and interacting each variable in X with male. Tests are formulated in terms of the interactions.

The empirical challenge is to devise an approach to estimating an effect of family size that is free from bias due to endogeneity of family size (Rosenzweig and Wolpin 1980, Angrist and Evans 1998). While this analysis does not explicitly correct for endogeneity using an approach such as instrumental variables or sibling fixed effects, certain concerns can be addressed within Specification (S5). For instance, mother's fertility may be endogenous with respect to her background, or correlated with her unobservables. But the bias will be constant by size of sibship and difference out when comparing birth order effects within family size.[11] Bias due to mother's fertility responding to sibling specific unobservables associated with enlistment (for instance, a health problem observable to the mother during childbearing years that will influence her childbearing and the likelihood the child will enlist) will not be addressed in this structure.

[11] Precision issues are more delicate in this application relative to others because the binary outcome is relatively rare. This makes within-family fixed effects and instrumental variables less useful than other applications in this context.

Observations are weighted by the 1979 individual sampling weight for both cohorts; the weight for the NLSY79-YA cohort refers to the mother's sampling weight. The standard errors are adjusted to account for family specific heterogeneity.

IV. Data

The data are from the NLSY79 and NLSY79-YA, the associated Young Adults Survey. Although the two data sets are linked, they are treated as separate data sets for the purpose of this analysis.

The NLSY79 surveys 12686 men and women age 14-22 in 1979. They were followed annually until 1996, at which point they were followed biennially.[12] Beginning in 1994, the biological children age 15 and over of the women on the NLSY79 were surveyed in the Young Adults (YA) Survey. The YA's continue to be surveyed biennially. Data are most recently available for both surveys for 2004. Data for mothers and young adults can be readily linked.

The dependent variable is a dummy variable indicating that the respondent has enlisted during the calendar year. Both data sets have series of variables on military service, which are roughly comparable and used to construct the enlistment dummy. "Enlistment" here is defined as the initial commitment to any military service, including the active and reserve components and national guard. There are no draftees in the sample, and very few cases in which the initial commitment was as a commissioned or warrant officer.

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[12] The original NLS sample includes a "military subsample" of 1280 individuals age 17-21 serving in the military as of September 30, 1978. Analyses were conducted with and without the military subsample, and key results were qualitatively unaffected. Unless otherwise specified, the analysis excludes the military subsample. Appendix Figures 1 and 2 exclude data from the military subsample.

The distribution of enlistments by year for the NLSY79 is plotted in Figure 3. Because the median year of birth is 1961, and the typical age of enlistment is between age 19 and 21, the median year of enlistment is 1981. Over seventy-five percent of the sample who enlisted did so between 1977 and 1983. This was the period of particularly low quality - after the Vietnam era GI bill was discontinued, compensation was relatively low, and the impact of the ASVAB misnorming was greatest.

Figure 4 plots the same distribution for the NLSY79-YA sample. The median enlistment year for this sample is 2000. Most of these enlistments fall between 1996 and 2003. While not the peak years of quality, they correspond to a period of higher quality than the early years of the AVF era, and one in which educational benefits were stressed.

Sibship characteristics are the key independent variables. For the NLSY79, detailed questions on siblings are asked in 1993. From these questions, it is possible to compute the sex and age of each sibling. The same variables are derived from mothers' fertility files for the NLSY79-YA.

In 1994, 1996, and 1998, young adults report whether they had a dangerous job, and this is the dependent variable in an ancillary analysis.

The set of background and control variables include age, year of birth, religion (Baptist, Catholic, and other Protestant) region (Northeast, Northcentral and South) and parents' education. Observable measures of skills include education and score on a standardized test. For the early cohort, the AFQT is the standardized test. For the later cohort the Peabody Individual Aptitude Test (PIAT) taken closest to eight year of age is a proxy for AFQT.

V. Results

Table 2 reports the results of specializations (S1) through (S4). In addition to the coefficients for men and women separately, the p-values for the test that the coefficients for men and women are significantly different are reported.[13]

The only sibling variable in (S1) is the number of children in the family. The effect is positive and significant for men in the specification with controls. The coefficient of .02 (z=2.0) indicates that each additional sibling raises the likelihood of enlistment. There is no significant effect of number of siblings on enlistment for the later cohort.

Birth order effects are introduced in (S2). For the early cohort, the likelihood of enlistment increases with parity (birth order) for men. This is not surprising as birth order and sibship size are positively correlated. However, enlistment *declines* with birth order for men in the later cohort.

There are no significant effects of family size or birth order on military service for women. Because military service was rarely observed for women in the early cohort, and still unlikely in the later cohort, it is often the case that estimates for women are less precise than those for men and difficult to reject hypotheses.

Sibling gender effects are introduced in (S3) in terms of the difference between the number of brothers and sisters. Having brothers relative to sisters reduces women's

[13] Coefficient estimates for the control variables are not reported here but are broadly consistent with the literature, eg Teachman et al (1993a, 1993b), Hosek and Peterson (1990), and Kilburn and Klerman (2000).

likelihood of enlistment in the early cohort and increases the likelihood of enlistment in the later cohort.

Birth order and gender are introduced jointly in (S4), which separates the number of older and younger siblings of each gender. For the early cohort, sisters increase the likelihood of enlistment more than brothers for women. For the later cohort, the effect of brothers relative to sisters is positive for women, and the effect of older siblings is significantly more positive for men than for women. The family stability effect dominates for the early cohort and the demonstration effect dominates for the later cohort. The estimates for birth order are consistent with those for (S2).

Results for Specification (S5), are reported in Tables 3a and 3b. This model is a more general specification of the birth order and sibship size effects. Sib(i)_(k) are dummy variables indicating an individual of parity (i) in sibship size (k). Each equation includes dummy variables for each parity for sibships up to size three are included, and dummy variables for parities 1-3 for larger sibships (sibship size=j) are included as well. The omitted category is singletons (only children).

Tables 3a and 3b report differences in probit coefficients, and the p-values from hypothesis tests that the differences are equal to zero. Table 3a compares sibship size by parity, and table 3b compares parity by sibship size.

For men, no significant effects are apparent for every comparison of sibship size by parity. However, enlistment significantly increases with parity within each family size. The increased likelihood of service for individuals from larger families arises because the younger siblings are more likely to enlist than their older siblings. [14]

Significant (independent) effects of family size or birth order for women in the early cohort cannot be detected, although overall, enlistment increases with parity for women with three siblings (p=.05) in the early cohort. Cell counts were too small to estimate (S5) for women in the later cohort

For the first three rounds, the NLSY79-YA reports whether the respondent's (civilian) job is dangerous. In families with three children, the likelihood that a job the young adult takes is dangerous increases with birth order. This is consistent with the findings of Argys et al (2006) that later borns are more likely to take risks.

VI. Conclusion

These results show that sibling configuration plays a role in one unique occupational choice – military service. However, the nature of the effects differs between the two cohorts of individuals studied: the NLSY79, who were enlistment age around 1980, and the NLS79-YA, who were enlistment age around 2000. The contrast is consistent with the differences in the nature of military service and the economic and social environments experienced by the two groups.

For the early cohort, having sisters relative to brothers increases the likelihood of service. This effect, for women, is driven by younger siblings. There is weak evidence that

[14] This finding echoes Black, Devereux and Salvanes (2005) who find that a negative relationship between family size and education disappears after allowing for birth order.

having sisters relative to brothers increases the likelihood of service as well. For the later cohort, having older brothers relative to older sisters increases the likelihood of service for women; there is no gender effect of younger siblings, and there is no effect of sibling gender for men.

Economic models of child gender predict two countervailing effects of sibling gender effects on military service. On one hand, having sons relative to daughters enhances marital stability, and individuals from more stable families are less likely to enlist. However, brothers demonstrate traditionally male roles, and this is particularly true for older brothers of girls.

The marital stability effect dominates in the earlier cohort, while the demonstration effect dominates for the later cohort.

Birth order effects have been a topic of interest in several fields for decades. Within economics, there seems to be general agreement that if there are effects, they are in the direction of older children being more intelligent, achieving and stable than their younger siblings – at least in developed countries. The data here show clear birth order effects on enlistment – but in opposite directions for the two cohorts. However, they are consistent with the literature given the variation in the institutional structure across the AVF era.

The two NLSY cohorts coincide with the early and late periods of the AVF, the first in which personnel quality was problematic and the second after which measures were undertaken to attract higher quality recruits. The birth order effects for the two cohorts reflect negative selection for the cohort and positive selection for the late cohort.

There are some caveats.

First, while the number of siblings is exogenous to an individual, the variable is chosen by the parents and potentially correlated with unobservables in the enlistment equations. Comparing parity within family size mitigates some of the concerns regarding these biases, but if subsequent fertility depends on outcomes of prior births, birth order effects may be biased. Gender effects are less likely to be subject to concerns about endogeneity bias.

Second, the inferences regarding selection based on quality are suggestive. More conclusive results require direct tests of hypotheses regarding the effects of changes in policy parameters on quality.

There are several implications of these results.

First, as MacLean and Elder (forthcoming) outline, and Angrist's (1990, 1998) and Angrist and Krueger's (1994) work underscores, military service is a heterogeneous experience and the selection effects vary over period. While the literature has focused on heterogeneity between, say, the WWII, Vietnam and AVF eras, these results demonstrate that there is substantial heterogeneity even within different phases of the all-volunteer era.

Second, siblings matter. Military service is one – albeit unique – occupational choice. Much of the literature on sibling effects focus on outcomes that are clearly "good", such as education or academic achievement, or "bad", such as risky behavior. Military service is not clearly a good or a bad. There may be a wide range of economic outcomes that are affected by sibling configuration. .

Third, sibling gender matters – and the nature of the effect is changing. Several studies of child gender for the period corresponding to the earlier cohort find that marriages with sons are more stable than those with daughters. These results suggest that the effects on family stability spill over on siblings and ultimately impact at least one occupational choice. But as the military has become increasingly female, the demonstration effect begins to outweigh the stability effect.

Fourth, the interpretation of the sibship size effect hinges on attention to nuances. Several studies report that men with more siblings are more apt to serve in the military. Taken at face value, this pure sibship size effect is consistent with either a model of credit constraints, or declining aversion with respect to risk of death of a family member. This interpretation would portend a shrinking pool of volunteers for the all-volunteer force as fertility rates decline.

But closer inspection indicates that the relationship is more complex. The apparent family size effect for the early cohort is due to birth order, not family size *per se*. Enlistment increases with parity, and high parity siblings are more apt to be found in larger families. The weight of the literature on birth order effects attributes the birth order effects to differences in parents' ability to provide attention and financial resources to children at critical ages. The greater likelihood of enlistment with respect to parity for the early cohort reflects the poorer performance of younger siblings along a variety of dimensions. But birth order effects on enlistment shifted throughout the AVF era, with older siblings now more likely to serve. This suggests that educational benefits have increased the quality of recruits along unobservable dimensions not captured with the standard set of background variables. Declining family size does not appear to be an issue in terms of supply of manpower.

Both the military and the family have changed considerably over the past thirty years. Understanding the shifting relationship between these two institutions throughout the period illuminates the nature of each.

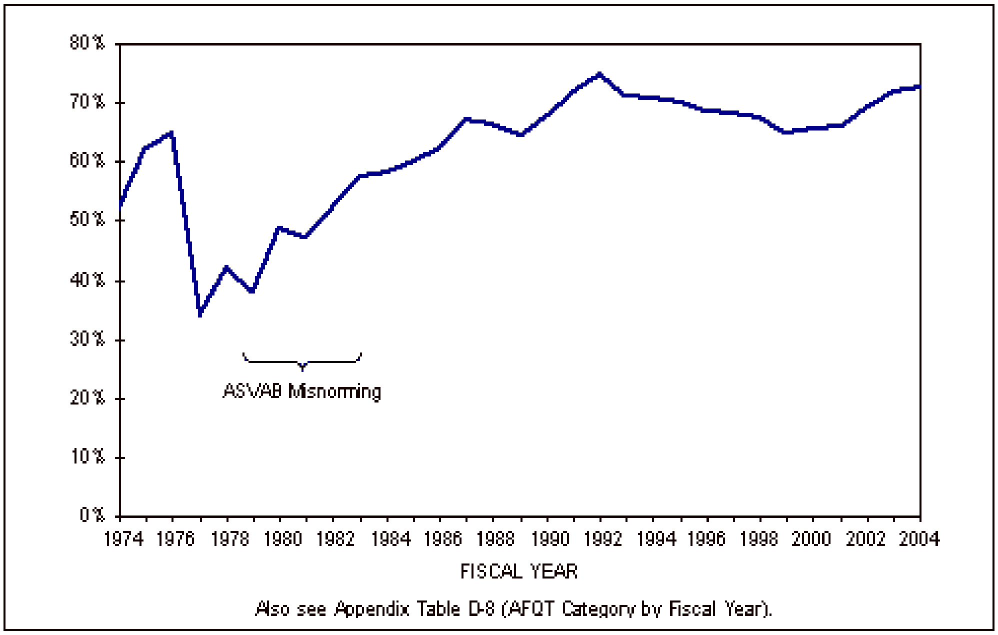

Figure 1: Proportion of Accessions with High School Diploma

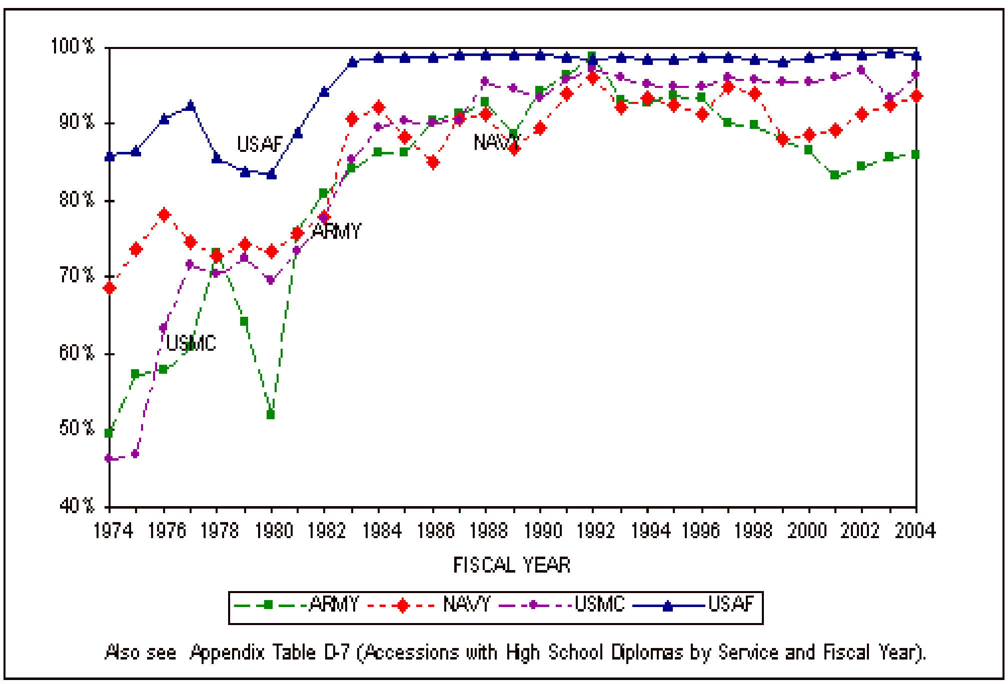

Figure 2: Proportion of Accessions AFQT Scores Category III-A or Better

Source: Population Representation in the US Military Services, Office of the Under Secretary of Defense, Personnel and Readiness (DoD 2004)

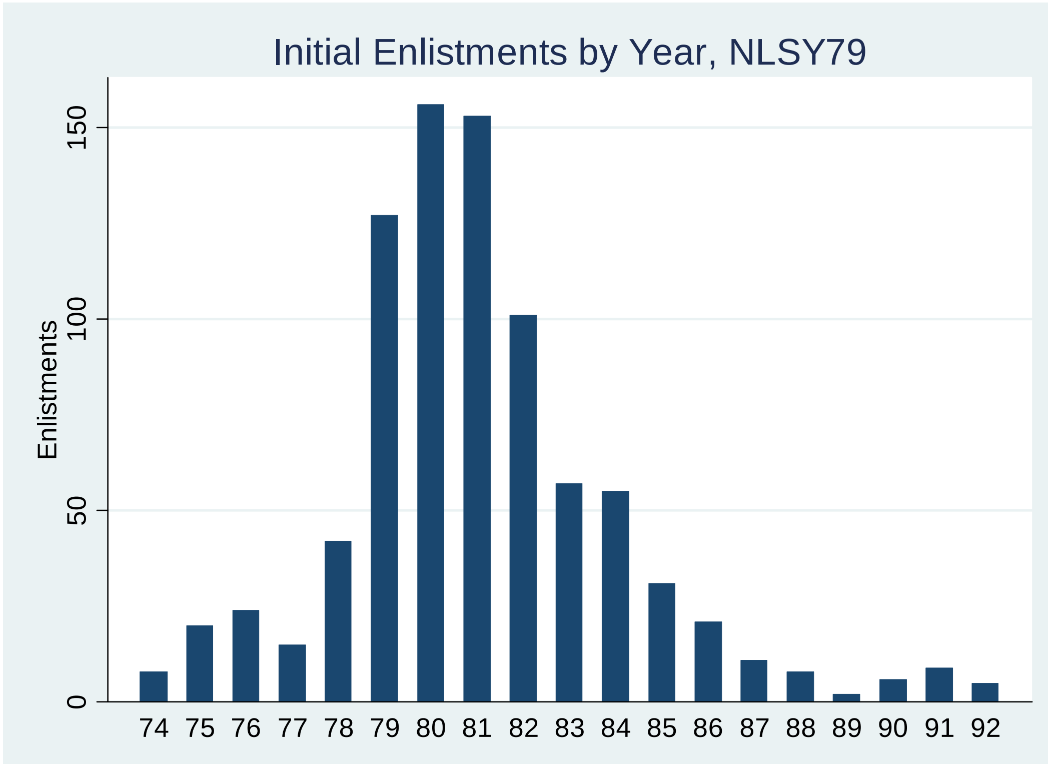

Figure 3

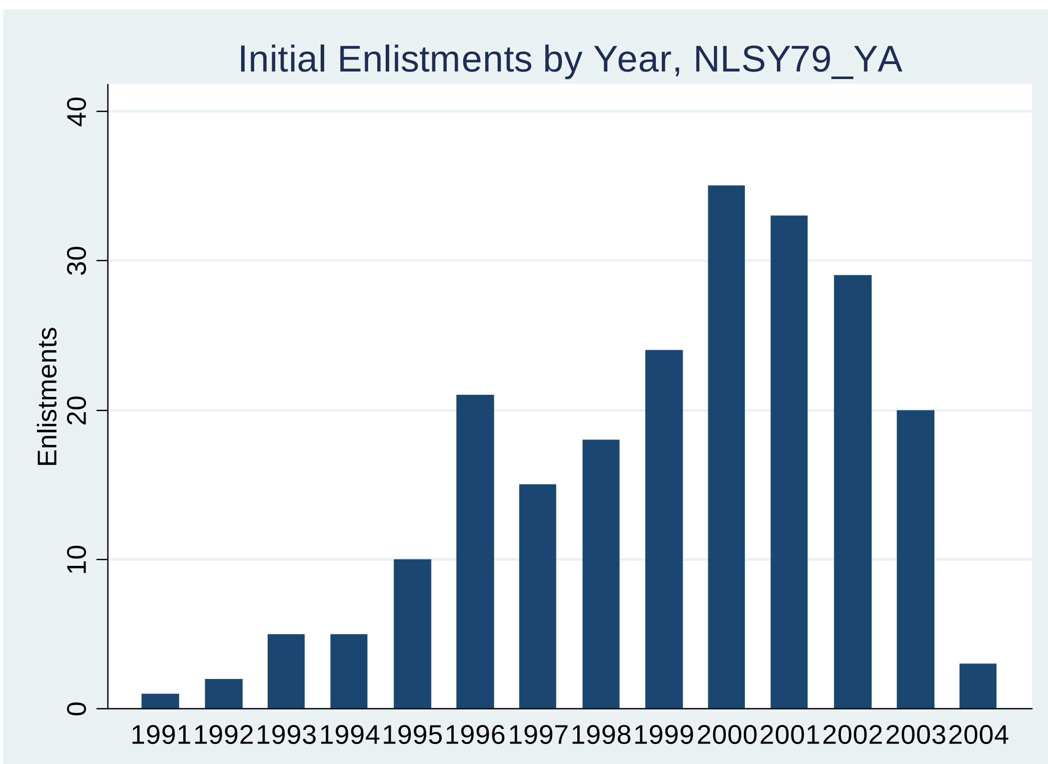

Figure 4

Table 1
Siblings and Soldiers: Predictions

Number of Siblings	By Cohort	Cohort Comparison	Other Comparison
(1) Credit Constraints	+	Early < Late	
(2) Quantity/Quality	+	Early< Late	
(3) Mortality Risk	+	Early < Late	Men>Women
(4) Heterogeneity in Preferences	+	Early < Late	
Birth Order (Increasing with Parity)			
(5) Birth Order Specific Credit Constraints	+	Early > Late	
(6) Heterogeneity in Propensity for Risk Taking	-	Early < Late	
(7) Heterogeneity in Quality	Ambiguous, but Declining	Early > Late	
Sibling Gender (Boys – Girls)			
Family Stability	-	Early>Late	
Demonstration	+		

Table 2: Likelihood of Enlistment
(Probit coefficients, z-scores in parentheses)

Cohort		Early			Late		
		Men	**Women**	**M-W (p)**	**Men**	**Women**	**M-W (p)**
Spec	**Sibling Characteristic**						
(S1)	Number of Siblings	**.03 (2.0)**	.002 (.11)	.34	-.035 (.88)	.052 (1.0)	.15
(S2)	Birth Order	**.11 (5.6)**	.013 (.5)	**.02**	**-.216 (3.5)**	.016 (.20)	.02
(S3)	Brothers – Sisters	-.005 (.3)	**-.06 (2.5)**	.07	-.034 (.67)	**.128 (1.6)**	**.07**
(S4)	Older Brothers	**.08 (2.5)**	-.02 (.5)	.11	**-2.44 (.02)**	-.098 (.8)	**.02**
	Older Sisters	**.13 (4.0)**	.05 (1.2)	.15	-.131 (1.5)	-.157 (1.3)	.84
	Younger Sisters	-.01 (.50)	**-.07 (1.7)**	.27	-.008 (.12)	.029 (.35)	.73
	Younger Brothers	-.02 (.8)	.06 (1.6)	.27	.044 (.66)	-.059 (.62)	.46
	P(OldSis=OldBro)	*.30*	*.31*	*.78*	*.45*	*.13*	***.07***
	P(YngSis=YngBro)	*.83*	***.04***	***.08***	*.60*	*.51*	*.47*
	P(OldSis=YngSis)	***<.001***	*.82*	*.04*	***.10***	*.52*	*.77*
	P(OldBro=YngBro)	***.02***	*.46*	*.72*	***.06***	*.62*	***.07***
	P(Sisters=Brothers)	*.54*	***.03***	*.17*	*.38*	***.08***	***.07***
	P(Older=Younger)	***<.001***	*.60*	***.04***	***.009***	*.87*	*.12*

Table 3a: Likelihood of Enlistment: Sibship Size by Parity
Difference in probit coefficients (p-values)

Cohort		Early			Late
Parity		**Men**	**Women**	**M vs. W**	**Men**
1	Sib1_2-Sib1_1	-.06 (.75)	.22 (.46)	-.26 (.45)	.09 (.65)
	Sib1_3-Sib1_1	-.22 (.28)	.07 (.22)	-.26 (.43)	.06 (.78)
	Sib1_j-Sib1_1	.04 (.23)	.12 (.47)	-.08 (.8)	.10 (.68)
	Sib1_3-Sib1_2	-.15 (.35)	-.15 (.59)	-.02 (.9)	-.03 (.85)
	Sib1_j-Sib1_2	.11 (.45)	-.10 (.67)	.18 (.5)	.004 (.9)
	Sib1_j-Sib1_3	.26 (.07)	.05 (.82)	-.20 (.5)	.034 (.08)
	P(Sib1_2=Sib1_3= Sib1_j=Sib1_1)	(.32)	(.8)	(.8)	(.97)
2	Sib2_3-Sib2_2	-.26 (.11)	(.06) (.78)	-.32 (.3)	-.067 (.74)
	Sib2_j-Sib2_2	.05 (.70)	.12 (.56)	-.08 (.7)	-.17 (.4)
	Sib2_j-Sib2_3	.31 (.30)	.06 (.78)	.23 (.3)	-.10 (.6)
	p(Sib2_2=Sib2_3= Sib2_j)	(.09)	**(.05)**	(.5)	(.75)
3	Sib3_j –Sib3_3	(-.04) (.74)	-.03 (.3)	-.04 (.8)	.23 (.43)

Table 3b: Likelihood of Enlistment: Parity by Sibship Size
Difference in probit coefficients (p-values)

	Cohort	Early			Late
Sibship Size		**Men**	**Women**	**M vs. W**	**Men**
2	Sib2_2-Sib2_1	**.28** **(.07)**	-.07 (.8)	.33 (.3)	-.095 (.58)
3	Sib2_3=Sib1_3	.19 (.25)	.14 (.6)	.03 (.9)	-.13 (.48)
	Sib3_3=Sib1_3	**.61** **(<.001)**	.22 (.4)	.35 (.2)	**-.61** **(.02)**
	Sib3_3=Sib2_3	**.42** **(<.01)**	.08 (.7)	.32 (.2)	**-.48** **(.06)**
	p(Sib1_3=Sib2_3=Sib3)	**(<-.001)**	(.7)	(.4)	**(.05)**
>3 **(j)**	Sib2_j=Sib1_j	**.23** **(.04)**	.15 (.4)	.07 (.7)	-.27 (.22)
	Sib3_j=Sib1_j	**.30** **(.007)**	.15 (.4)	.12 (.6)	**-.41** **(.09)**
	Sibj_j=Sib1_j	**.35** **(<.001)**	.04 (.8)	.25 (.2)	**-1.1** **(.01)**
	Sib3_j=Sib2_j	.07 (.50)	-.002 (.9)	.05 (.9)	-.14 (.58)
	Sibj_j=Sib2_j	.12 (.24)	-.11 (.5)	.18 (.3)	**-.74** **(.08)**
	Sibj_j=Sib3_j	.04 (.67)	-.11 (.5)	.13 (.5)	-.60 (.17)
	p(Sib1_j=Sib2_j=Sib3_j=Sibj_j)	**(.007)**	(.7)	(.6)	**(.05)**

Table 4a: Likelihood Dangerous Job: Sibship Size by Parity
Difference in probit coefficients (p-values)

Parity		**Males and Females Pooled**
1	Sib1_2-Sib1_1	-.21 (.20)
	Sib1_3-Sib1_1	-.05 (.77)
	Sib1_j-Sib1_1	-.12 (.65)
	Sib1_3-Sib1_2	.16 (.79)
	Sib1_j-Sib1_2	.09 (.52)
	Sib1_j-Sib1_3	-.07 (.62)
	p(Sib1_2=Sib1_3=Sib1_j=Sib1_1)	(.46)
2	Sib2_3-Sib2_2	.23 (.23)
	Sib2_j-Sib2_2	.31 (.13)
	Sib2_j-Sib2_3	.08 (.67)
	p(Sib2_2=Sib2_3=Sib2_j)	(.29)
3	Sib3_j –Sib3_3	**-.58** **(.05)**

Table 4b: Likelihood of Dangerous Job: Parity by Sibship Size
Difference in probit coefficients (p-values)

Sibship Size		**Males and Females Pooled**
2	Sib2_2-Sib2_1	-.008 (.96)
3	Sib2_3=Sib1_3	-.059 (.71)
	Sib3_3=Sib1_3	**.714 (.003)**
	Sib3_3=Sib2_3	**.655 (.01)**
	p(Sib1_3=Sib2_3=Sib3)	**(.01)**
>3 (j)	Sib2_j=Sib1_j	.21 (.21)
	Sib3_j=Sib1_j	.21 (.38)
	Sibj_j=Sib1_j	.31 (.29)
	Sib3_j=Sib2_j	-.005 (.98)
	Sibj_j=Sib2_j	.09 (.76)
	Sibj_j=Sib3_j	.09 (.74)
	p(Sib1_j=Sib2_j=Sib3_j=Sibj_j)	(.51)

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