Parental Status and Differential Investment in Sons and Daughters: Trivers-Willard Revisited*

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Abstract

According to the Trivers-Willard (T-W) hypothesis there is an interaction between individual status and investment in offspring such that high-status individuals invest more in boys, and low-status individuals invest more in girls. Parental investment may be both physiological and affect the sex ratio of offspring, or it may be psychological and affect resource allocation to offspring. I test both components of the hypothesis using cumulative U.S. General Social Survey (GSS) data and find results that support T-W. Using years of education attained as an indirect measure of parental investment, I find that sons of high-status fathers attain more education than daughters and that the daughters of low-status fathers attain more education than sons. Supporting the sex ratio component of T-W, I find that high-status men have more sons.

Sociological studies of status attainment have demonstrated the importance of parental investment in the educational, financial, and cultural capital necessary for status attainment in contemporary American society (Blau and Duncan 1967; Hauser and Featherman 1977; Hauser and Mossel 1985; Steelman and Powell 1991; Bianchi and Robinson 1997; Keister 2000; Conley 2001; Treiman 2001). Parents and families are also important in shaping personality characteristics that are crucial to educational and occupational attainment, such as career motivations and educational aspirations (Jacobs, Karen, and McClelland 1991; Grabowski et. al. 2001; Smith 1991; Teachman and Paasch 1998; Bowles and Gintis 2002;

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Breen and Goldethorpe 2002; Buchmann and Dalton 2002; Crosnoe, Mistry, and Elder 2002). The family, as one of the primary socializers of children, is also a source of the differential sex roles that influence both career and educational aspirations (Correll 2001, 2004) and therefore the occupational outcomes of men and women.

These family processes are social processes. However, there is evidence that these family processes interact with the biological predispositions specific to each individual in the family. Behavioral genetics research suggests that genetic predispositions are important shapers of personality characteristics, including work styles and aspirations (Dunn and Plomin 1990). That is, at least some of the shaping of personality characteristics and career aspirations that occurs within the family is a reaction to each child as an individual. Jencks et. al. (1979) noted that IQ, which is also responsible in part for educational attainment and status attainment, is about 50% inherited (see also Kerckhoff, Raudenbush, and Glennie 2001). Thus, each child's actual educational and occupational attainment is in part a function of the capabilities and personality of the child (Bond and Saunders 1999; Bowles and Gintis 2002; Breen and Goldthorpe 2002; Chen and Kaplan 2003; Conley 2004).

There is also evidence that these family processes interact with the biological relatedness of family members to each other. How effectively parents invest in children is also related to whether or not the family is intact and the presence of nonbiologically related parents and/or children in the family. For example, Biblarz and Raftery (1999) have presented the counter-intuitive finding that stepfamilies are less able to promote the occupational mobility of children than female-headed families. Case, Lin, and McLanahan (2001) show that, all else being equal, children in stepfamilies attain less education than children in intact families.

One issue on which there are conflicting results is whether parents preferentially invest in the education of sons or daughters. In the contemporary U.S., unlike in many other societies, there is some evidence that girls receive more support for higher education than boys (Behrman, Pollack, and Taubman 1986). Some scholars have found that the presence of sisters, not brothers, hurts a woman's chances for educational attainment (Butcher and Case 1994), although others have not replicated this finding (Kaestner 1997). Girls are now the majority of college undergraduates, although they remain outnumbered by males in some professional and graduate schools (Jacobs 1996). This outcome is not what might be expected given traditional sex roles in the United States, which suggest that parents will invest more in the education of boys than in the education of girls. Consistent with traditional sex roles, other scholars have found that the number of brothers poses a greater obstacle than does the number of sisters to parents' financial support of their children's college education (Steelman and Powell 1989). Similarly, Conley (2000) found that the actual educational attainment of women is hurt more by the presence of brothers, while the educational attainment of men is hurt more by the presence of sisters. Steelman and Powell (1991) also found

that parents were more willing to go into debt to support their child's college education if their child was a boy than if the child was a girl. Other scholars find no effect of sex of child or sex composition of siblings on educational attainment (Jacobs 1996; Kaestner 1997) or on parental expectations for higher education (Rosen and Aneshensel 1978).

The reason for these mixed and sometimes conflicting results may be an interaction between the child's sex, parental status, and amount of parental investment. In fact, there is a long-standing hypothesis from evolutionary biology that predicts just such an interaction. This hypothesis, known as the Trivers-Willard hypothesis, predicts that *high-status individuals will invest more in sons, and low-status individuals will invest more in daughters* (Trivers 1972; Trivers and Willard 1973). This hypothesis was originally tested with species other than our own, where the majority of parental investment in offspring is strictly biological and limited to the gestation and nursing of young (e.g., Clutton-Brock, Albon, and Guiness 1984). Here the hypothesis takes a sex ratio form, with investment limited to the actual physiological investment of mothers in the production of either a son or daughter. In this form, the hypothesis suggests that mothers in good condition are more likely to give birth to sons, and mothers in poor condition are more likely to give birth to daughters.

Important for our purposes here, the Trivers-Willard hypothesis is not just applicable to the sex ratio at birth, but also to investment in offspring after birth. In humans, of course, these investments are extensive and include not only nurturing of children while they are young, but also investments in education and the social and cultural development of children. Trivers-Willard themselves explicitly extended their hypothesis to humans, writing: "the model can be applied to humans differentiated on a socioeconomic scale, as long as the reproductive success of a male at the upper end of the scale exceeds his sister's, while that of a female at the lower end of the scale exceeds her brother's" (Trivers and Willard 1973). Reproductive success is how evolutionary biologists refer to the number of surviving offspring—the *sine qua non* of evolution.

The logic of the Trivers-Willard hypothesis relies on this sex difference in the variance in reproductive success. This sex difference is found in the vast majority of sexually reproducing species, including humans. That is, highly reproductively successful men have many more children than highly reproductively successful women. On the other hand, less successful men are often shut out of reproduction altogether either through early death, disability, or destitution, while females are more rarely shut out. Another way of looking at this difference between male and female reproductive success is in terms of risk—males are a riskier reproductive bet than females. Like an investment in a reproductive stock market, males can give high reproductive returns, but they can also give none. Like an investment in a reproductive bank, females cannot give such high returns but are very unlikely to give none at all.

According to Trivers-Willard, given this sex difference in reproductive

variance, it will be in the reproductive interests of individuals to fine tune their investments in progeny by sex—in good conditions where external risks are lower, go for the riskier option (males); in poor conditions, go for the less risky option (females). The analogy with financial investments holds—in good conditions (a "bull" market), go for risky investments (stocks); in poor conditions (a "bear" market), go for the less risky options of bonds and bank accounts. Just as the latter maximizes investment income, the former maximizes reproductive success. Here the analogy ends, however. Financial investment is guided by a conscious strategy to maximize returns; reproductive investment need not be. *It is simply that in animal and human evolution, those behavioral strategies that have in the past favored reproductive success have been selected and have proliferated in the population; those strategies that did not favor reproductive success have literally died out.* The Trivers-Willard hypothesis says nothing about conscious motivations, which may or may not be present.

A key prerequisite for the logic of Trivers-Willard is the sex difference in variance of reproductive success (number of surviving offspring). This prerequisite appears problematic in contemporary industrialized societies where, given artificial contraception, the reproductive success of males and females is low and often appears very similar. That is, high-status males do not appear to outreproduce high-status females. Nevertheless, we remain physiological products of our evolutionary history, and we may have physiological adaptations to an evolutionary environment where high-status males did outreproduce high-status females. Furthermore, evolutionary psychology (Tooby and Cosmides 1990, 1992; Maryanski and Turner 1992; Cosmides, Tooby and Barkow 1992:5; Buss 1999; Cziko 2000) would suggest that we also have psychological adaptations to the environment of evolutionary adaptiveness (EEA). The EEA is the Pleistocene in Africa, when early humans lived as hunter-gatherers in societies of relatively small groups of people (80–100) with little economic stratification.

Was there a sex difference in the variance on reproductive success in the EEA? We will never know for sure, but studies of contemporary hunter-gatherer, nomadic pastoral, and other simple societies show status differentials among men, and that typically high-status males are the most reproductively successful individuals in the group in terms of producing the largest number of offspring (Lévi-Strauss 1955:370; Chagnon, Flinn, and Melancon 1979; Irons 1979; Hill 1984; Turke and Betzig 1985; Betzig 1993; Casmir and Rao 1995). Status in such groups was typically conferred on individuals for their hunting, fighting, leadership, healing, or religious skills. Lévi-Strauss (1955) notes that for the headman the privilege of having multiple wives was his only compensation for the burdens of leadership. Of course, if high-status men in such societies obtain more than one wife, then low-status men may not obtain a wife at all, creating a higher variance in reproductive success for men than for women. This evidence suggests that in the similar environment of Pleistocene hunter-gatherers, the sex difference in reproductive variance that is the basis of the Trivers-Willard

hypothesis did exist.[1]

Given this situation in the evolutionary environment, by the logic of Trivers-Willard, there may exist evolved psychological and physiological mechanisms that promote high-status parents to invest more in sons and low-status parents to invest more in daughters, regardless of any contemporary sex differences in reproductive success. Given such evolved mechanisms, we can expect high-status parents to invest more in sons, and low-status parents to invest more in daughters, even if males are not actually more reproductively successful in the contemporary environment. Investment of physiological resources will be manifest in the sex ratio at birth; investment of material resources will be manifest in differential resource allocation (e.g., providing education) by sex. Once again, this differential investment may or may not be conscious. Certainly, the evolutionary reason for the differential investment will not be conscious. No one is expected consciously to say to themselves: I am going to invest more in this sex child rather than the opposite sex child because of a difference in expected reproductive success. Furthermore, this differential investment in children by status of parents may mean that, on average, boys and girls in the society are invested in equally, and so overall there is no relationship between the sex of the child and parental investment received.

Application of Trivers-Willard to humans has been controversial, for both theoretical and empirical reasons. On a theoretical basis, many claim that hypotheses from evolutionary biology are simply not applicable to culture-bearing, modern humans (Gould 1997; Rose and Rose 2000; Marks 2002). Sociologists have frequently rejected any introduction of biology into sociology as deterministic, reductionist, or worse, ideologically biased (e.g., Lorber 1993). However, as previously noted, more and more sociological studies especially in the areas of family and demography have demonstrated the interaction of social with biological processes. Certainly, any rejection of a hypothesis from evolutionary biology should not be rejected simply because it is from biology.

Second, on an empirical basis, previous tests of both the resource allocation version and the sex ratio version of the Trivers-Willard hypothesis with human data have given mixed results. First, a great deal of evidence consistent with the resource allocation version of Trivers-Willard has been found among preindustrial populations or populations in less developed countries (e.g., in Kenya, Cronk 1989, 1993, 2000; Borgerhoff Mulder 1987, 1988, 1998; among gypsies in Hungary, Bereczkei and Dunbar 1997; in Poland, Koziel, and Ulijaszek 2001). Yet evidence in industrialized countries is more conflicting. There is some evidence of differential resource allocation to infants by parents in industrialized societies (Abernathy and Yip 1990; Gaulin and Robbins 1991). Smith, Kish, and Crawford (1987) found that wealthy Canadians left larger bequests to their sons than their daughters, while the reverse was true for poorer Canadians, but this was not replicated in California (Judge and Hrdy 1992). Two recent prominent studies of contemporary American society found no Trivers-Willard effect (Freese and

Powell 1999; Keller, Neese, and Hofferth 2001). Only Kanazawa (2001a) found some evidence of this effect in terms of time spent with adolescents aged 10–15; also Cox (2003) found evidence of this effect in his (limited) analysis of child education by parental wealth.

I suggest, however, that the measures of parental investment used in all these previous tests of the resource allocation version of the Trivers-Willard hypothesis in contemporary industrialized societies are flawed. All of these studies use self-reports of direct, proximate measures of investment, typically at relatively young ages. For example, Freese and Powell (1999) examine parental investment in adolescents in the form of measures such as saving money for college, use of private school, having educational objects in the home, talking to children about school, monitoring of children's behavior, while Keller, Neese, and Hofferth (2001) look at even more direct measures of investment in babies and small children including hours per week participated with children, self-reported warmth, and months breastfed (see also Gaulins and Robbins 1991). These measures are all based on self-reports, which themselves may sometimes be biased given our culture's egalitarian values (Keller, Neese, and Hofferth 2001:356; for an example of biased self reports, see Cronk 1991). However, it is also the case that in a wealthy society such as the U.S., large sex differences in these kinds of investments at these early stages are unlikely. That is, there are abundant resources available for parents to be able to make these early investments in all children regardless of sex. Evolutionary theory suggests that in such a situation of unusual abundance all children, irrespective of sex, will be highly valued and invested in by their parents (Hrdy 2000).

Moreover, as status attainment research in sociology has clearly shown, status attainment in American society requires much more than just investments in children as babies and adolescents; it requires ongoing investments in very lengthy periods of education and occupational training. High-status positions in American society require extensive training and education periods, in fact longer periods than most other contemporaneous advanced industrial societies. (For example, in many countries a medical degree is an undergraduate degree, not a graduate degree as it is in the U.S.). It is provision of support over such long periods of time that is the scarce resource in American society, not the provision of basic resources and support while children are young. I suggest, therefore, that the focus of studies testing the resource allocation version of Trivers-Willard should be sex differences in parental provision of access to extensive training and education and encouragement of this process. In this study, I use years of education attained as an indirect, but behavioral measure of parental investment.

> *Hypothesis 1*: Among high-status families, boys will be more likely to be supported in further education and therefore attain more years of education than girls. Among low-status families, girls will be more likely to be supported in further education and therefore will attain more years

of education than boys.

Given the correlation between class standing and racial classification in American society, hypothesis 2 also follows:

Hypothesis 2: Among African American families, girls will be more likely to be supported in further education and therefore attain more years of education than boys.

For the sex ratio hypothesis, once again the empirical evidence is conflicting. Studies that have supported the Trivers-Willard sex ratio hypothesis include those reported by Mueller (1993), Betzig and Weber (1995), Chacon-Puignau and Jaffe (1996), Gibson and Mace (2003), and Catalano (2003); those which have not supported the hypothesis include Essock-Vitale (1984), Mueller (1993—for nineteenth- and early twentieth–century British elite), Marleau and Saucier (2000), and Ellis and Bonin (2002). The mechanism typically proposed for the effect of status on sex ratio is the condition of the mother: high-status mothers are more likely to be in good condition than other mothers, and mothers in good condition are better able to carry a male fetus to term (Catalano 2003). High-status women are therefore more likely to have boys among their offspring. However, to my knowledge there have been no tests of the sex ratio version of the hypothesis using representative data from the general U.S. population. All previous tests (with both positive and negative findings) have been on convenience samples. For example, Lee and Bonin (2002) used convenience samples of college students; Marleau and Saucier (2000) used convenience samples of pregnant women in Montreal, Canada. In this study I am able to test the sex ratio hypothesis with information from a representative sample of Americans.

Hypothesis 3: The sex ratio of offspring will vary by status, with higher-status individuals having more boys among their biological offspring than lower-status individuals.

Data and Methods

To test these hypotheses, I use the cumulative data from the 1972–2000 General Social Surveys (GSS) conducted at the National Opinion Research Center at the University of Chicago (Davis and Smith 1998). Each survey is an independently drawn, multistage probability sample of noninstitutionalized, English-speaking persons aged 18 or over living in the United States. These surveys are widely available, reputable surveys of the American population.

TEST OF RESOURCE ALLOCATION HYPOTHESIS

Dependent Variable—Measure of Parental Investment

To measure parental investment, I use respondents' actual educational attainment in terms of *years of education (actual number, range 0–20 years)*. As a measure of investment, educational attainment is admittedly crude and does not get at any difference in quality or type of education attained (which also differs by sex). Furthermore, educational attainment is not a direct measure of parental investment. However, it may be considered an indirect measure of parental investment, in that parental investment greatly increases the likelihood of attaining high levels of education. Given that investment in children's education is perhaps the primary investment parents make in their children in contemporary U.S. society, years of education attained will reflect parental investment better than any other indirect measure. Such investment may be in the form of financial support, including gifts of money, food, and goods; or it may be in the form of emotional support, including encouragement and moral support. Clearly, not all individuals who attain higher levels of education do so with such parental support, but many do. Furthermore, those with parental support are more likely to achieve high levels of educational attainment than those without parental support. Thus, years of education attained may be considered an indirect measure of parental investment, if not a perfect one.

Independent Variable—Measures of Parental Status

Previous studies testing Trivers-Willard have used parental education and income as measures of parent status. These are reasonable, if incomplete measures of social status. Here, I use four measures of the status of the father's (or substitute father's) occupation when the respondent was 16 years old: *two measures of socioeconomic status (SEI)—SEI 70 and SEI 80*—and *two measures of occupational prestige—Prestige 70 and Prestige 80*. There are two of each type of measure simply because occupation variables from earlier surveys were coded with one set of census codes (1960–70 codes), and occupation variables from later surveys were coded with a second set of census codes (1980). There is a slight overlap of not more than 10% between the samples using the 1970 codes and those using the 1980 codes.

The SEI measures are measures that have been computed from measures of education, income, and prestige in a manner similar to that employed by Duncan (Blau and Duncan 1967). The first of the SEI measures here (SEI 70) is for those respondents whose father's occupations were coded according to the 1970 U.S. census codes and a second measure (SEI 80) for those respondents whose father's occupations were coded according to the 1980 census codes. These measures of status have been used in a variety of sociological studies of status attainment

(e.g., Blau and Duncan 1967; Hauser and Featherman 1977; Kerckoff et. al. 1989; Rytina 2000). Occupational prestige measures social standing of the occupation. The measures of occupational prestige here were taken from ratings systems developed at NORC in 1963–65, and updated in 1989.

These measures of father's occupational status are preferable to simply income or education because they measure social standing, which is arguably a better measure of parental status than simply income or education alone. Father's status is used rather than mother's status because father's occupational status has traditionally been higher than mother's occupational status and thus more important in determining the status of the family. Although it may be argued that male occupational status is no longer as important in determining the status of the family as it once was, the continuing importance of male occupational status is suggested by the finding that male occupational status (but not female occupational status) continues to be an important factor in marriage formation (Oppenheimer 2000).

Control and Other Independent Variables

Given that years of education will be influenced by age of respondent, age is an important control variable and is measured as *respondent's age (in years)*.

Two additional control variables are included because they may be expected both to decrease and augment, respectively, resources available to each child net of parental status. The first variable, *number brothers and sisters (actual number, including step and adopted siblings)*, is an important control variable because number of siblings can be expected to dilute the level of parental resources available for each child. Previous studies have shown that the number of siblings a person has decreases their level of educational attainment net of other factors (e.g., Steelman and Powell 1989; Downy 1995). The second variable is *family income when the respondent was 16 (coded 1=far below average to 5=far above average)*. It is an important control variable because it is a measure of resources available to each child, separate from the measures captured by the variable *occupational status of father*. Measures of family income have also regularly been shown to have a positive effect on educational attainment (Steelman and Powell 1991).

In the analyses which included all cases, a weight variable, *weighting*, was used to compensate for those surveys where African Americans were over sampled. Sex of respondent is measured as a dummy variable, *Sex (Male =1)*.

TESTS OF SEX RATIO HYPOTHESIS

I test the sex ratio hypothesis in two ways. First, given that the GSS is based on probability samples of the American population, if high-status individuals are indeed more likely to have male offspring, then male respondents should

disproportionately have high-status parents. Once again, parental status is measured using the occupational status of the father, so male respondents should be more likely to have high-status fathers. To test this, I correlated *sex* of respondent with both the *occupational prestige (Prestige 70* and *Prestige 80)* and *socioeconomic status (SEI 70* and *SEI 80)* of their fathers.

Second, in 1994, respondents were asked detailed questions about each of up to nine children, including their sex and whether they were biological, adopted, or stepchildren. Using these variables, for each respondent I calculated the total number of biological children of each sex, and then calculated the *percentage of biological children who were boys (percent boys)*. I then used *percent boys* as the dependent variable in OLS regression analyses. Respondent status is measured in three ways: the respondent's own *occupational prestige (Prestige 80)*, *socioeconomic status (SEI 80)*, and intelligence *(number of words correct*). This last variable is the number of words the respondent knew on a short vocabulary test and is highly correlated with measured IQ (Vining 1986), which can be regarded as another measure of respondent social status.

Results

TESTS OF RESOURCE ALLOCATION HYPOTHESES

The results of the test of hypothesis 1 using years of education attained as the dependent variable are given in Table 1. This analysis includes all cases because the logic of Trivers-Willard pertains to status relative to all others in the society.

There are three models for each of the four measures of father's occupational status (SEI 70, SEI 80, Prestige 70, and Prestige 80). Model 1 contains as predictors respondent sex, father's occupational status, the interaction between sex and father's status, and respondent age; Model 2 adds number of siblings; Model 3 adds family income when respondent was aged 16.

Results are consistent across all years and all measures of status of father's occupation. Father's occupational status had strong positive effects on educational attainment across all models. Across all models except one, there was a significant interaction between sex and father's status in the positive direction predicted by Trivers-Willard. This positive coefficient indicates that an increase in father's status produces a significantly greater increase in the education of sons than in the education of daughters, just as Trivers-Willard predicts (see Figure 1). Although sex had a significant effect on educational attainment in only 3 out of the 12 models, its effect was consistently negative (with one exception which was essentially 0). These findings suggest that for respondents whose fathers have zero prestige, all else being equal, boys attain fewer years of education than girls—once again just as Trivers-Willard predicts. Age had a negative effect on years of education across all models. Number of siblings had a negative effect

Table 1. Unstandardized Regression Coefficients, Regression of Highest Year of School Completed on Sex, Age, Parental Status and Resources, All Cases 1972–2000

	Model											
	1	2	3	1	2	3	1	2	3	1	2	3
Independent variables												
Sex (male=1)	–.223*	–.342**	–.301**	–.171	–.223†	–.195	.004	–.119	–.074	–.229	–.268†	–.278
	(.116)	(.111)	(.111)	(.124)	(.121)	(.176)	(.131)	(.125)	(.124)	(.164)	(.161)	(.231)
Father's status at 16												
SEI 70	.078***	.064***	.056***									
	(.002)	(.002)	(.002)									
SEI 80				.052***	.047***	.038***						
				(.002)	(.002)	(.002)						
Prestige 70							.069***	.057***	.048***			
							(.002)	(.002)	(.002)			
Prestige 80										.067***	.060***	.049***
										(.002)	(.002)	(.004)
Sex by father's status	.010***	.013***	.012***	.007**	.008**	.008*	.005†	.007*	.006*	.009*	.009**	.010*
	(.003)	(.003)	(.003)	(.002)	(.002)	(.004)	(.003)	(.003)	(.003)	(.004)	(.004)	(.005)
Age	–.047***	–.041***	–.039***	–.030***	–.026***	–.030***	–.054***	–.045***	–.045***	–.033***	–.028***	–.032***
	(.001)	(.001)	(.001)	(.001)	(.001)	(.002)	(.001)	(.001)	(.001)	(.001)	(.001)	(.002)
Number of siblings		–.250***	–.236***		–.189***	–.214***		–.279***	–.259***		–.199***	–.223***
		(.006)	(.006)		(.007)	(.011)		(.006)	(.006)		(.007)	(.011)
Family income at 16			.397***			.424***			.048***			.476***
			(.025)			(.041)			(.002)			(.040)
R^2	.216	.272	.279	.164	.201	.229	.176	.247	.259	.138	.179	.219
N	21,882	21,846	21,794	15,305	15,265	7,339	22,176	22,269	22,089	15,484	15,444	7,448

Note: Standard error in parentheses

† $p<.1$ * $p<.05$ ** $p<.01$ *** $p<.001$

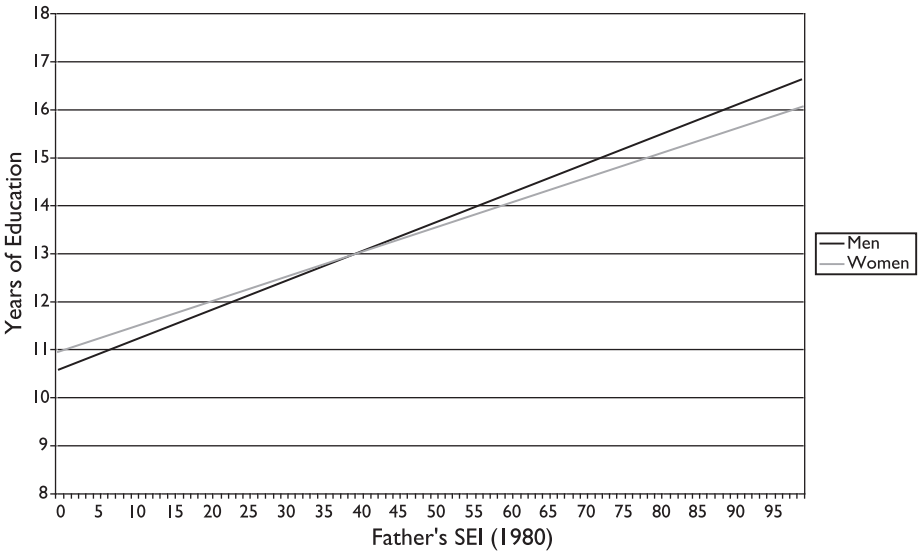

Figure 1. Years of Education by Father's Socioeconomic Status (1980)

on number of years of schooling across all models, while family income had a positive effect on years of schooling across all models.

The significant coefficients on the interaction terms were not due to heteroskedasticity in the data (especially greater variance on the dependent variable for males than for females). Tests for heteroskedasticity (plotting unstandardized predicted y values against studentized residuals) showed that heteroskedasticity was not extreme and was within reasonable levels for regression analysis (Fox 1991: 52). Nor are the results due to differences in family structure by socioeconomic class. That is, it could be argued that lower-status families are more likely to be characterized by divorce, and this possibly could hurt the educational prospects of boys more than girls. Controlling for family structure by only including survey respondents whose families were intact at age 16 yielded identical results (analysis not shown).

Table 2 gives results to an analysis identical to Table 1 but includes African American respondents only. Once again, results are fairly consistent across all measures of status of father's occupation. Sex was only a significant predictor of years of education attained in three models, and in a negative direction. Given the interaction term, these results should be interpreted as showing that sons of hypothetical fathers with zero status or prestige obtain less education than daughters of hypothetical fathers with zero status or prestige. Father's occupational status had strong positive effects on educational attainment across all models. The interaction between sex and father's status was significant in only

Table 2. Unstandardized Regression Coefficients, Regression of Highest Year of School Completed on Sex, Age, Parental Status and Resources, African Americans Only 1972–2000

	Model											
	1	2	3	1	2	3	1	2	3	1	2	3
Independent variables	–.726*	–.805*	–.624†	–.493	–.065***	–1.138†	.035	–.037	.208	–.263	–.283	–.661
Sex (male=1)	(.365)	(.360)	(.360)	(.425)	(.004)	(.666)	(.383)	(.377)	(.375)	(.515)	(.511)	(.784)
Father's status at 16												
SEI 70	.060***	.006***	.047***									
	(.007)	(.007)	(.007)									
SEI 80				.039***	.038***	.035***						
				(.007)	(.007)	(.010)						
Prestige 70							.031***	.029***	.024***			
							(.007)	(.007)	(.006)			
Prestige 80										.034***	.033***	.035**
										(.008)	(.008)	(.013)
Sex by father's status	.004	.006	.002	.003	.003	.012	–.017†	–.016†	–.021*	–.003	–.003	–.001
	(.011)	(.011)	(.011)	(.010)	(.010)	(.016)	(.011)	(.010)	(.010)	(.013)	(.013)	(.020)
Age	–.102***	–.100***	–.094***	–.069***	–.065***	–.075***	–.107***	–.104***	–.096***	–.071***	–.067***	–.077***
	(.004)	(.004)	(.004)	(.004)	(.004)	(.007)	(.004)	(.004)	(.004)	(.004)	(.004)	(.007)
Number of siblings		–.123***	–.106***		–.103***	–.085**		–.141***	–.117***		–.108***	–.091**
		(.016)	(.016)		(.018)	(.030)		(.016)	(.016)		(.018)	(.030)
Family income at 16			.516***			.358**			.636***			.411***
			(.074)			(.122)			(.073)			(.121)
R^2	.291	.310	.321	.180	.199	.262	.262	.287	.306	.162	.182	.250
N	2,433	2,425	2,393	1,566	1,558	687	2,472	2,464	2,432	1,591	1,583	701

Note: Standard error in parentheses

† $p<.1$ * $p<.05$ ** $p<.01$ *** $p<.001$

Table 3. Correlations between Respondent Sex and Occupational Status of Father

	SEI 70	SEI 80	Prestige 70	Prestige 80
All cases				
Sex	.031**	.034**	.021**	.038**
N	22,126	15,363	22,424	15,544
African Americans only				
Sex	.024	.087**	.012	.088**
N	2,460	1,582	2,499	1,608

** $p < .01$

one model (using father's 1970 occupational prestige as the measure of father's status), and the coefficient was negative. This finding suggests that in the earlier years of the survey among African Americans, an increase in father's prestige produced a significantly greater increase in the education of daughters than in the education of sons. This effect is opposite to that found for the entire sample, although it is consistent with other evidence of the educational attainment of African American women (Cohen and Nee 2000). It is also consistent with Cronk's (1989; 1993; 2000) findings of preferential investment in daughters among the Mukogodo of Kenya, another group with low socioeconomic status. However, this significant negative interaction was not found using any of the measures of father's status. This significant negative interaction was also not found in any of the surveys from more recent years and may be due to recent improvements in the upward mobility opportunities of African Americans. That is, the logic of Trivers-Willard suggests that when prospects for upward-status mobility are good, parents will invest in boys, when prospects for upward-status mobility are poor, parents will invest in girls. If African Americans with means are no longer preferentially investing in girls, it may be because possibilities for upward mobility have improved for African Americans in American society as a whole. Once again, age and number of siblings had a negative effect on number of years of schooling across all models, while family income had a positive effect on years of schooling across all models.

In sum, both tests gave substantial support for both hypotheses 1 and 2. Among high-status families, boys attain more years of education than girls. Among low-status families, girls attain more years of education than boys. This was particularly true for African American families, which in the data from earlier years sponsored the education of girls much more effectively than that of boys.

TEST OF SEX RATIO HYPOTHESIS

In the first test of the sex ratio hypothesis, I correlated respondent sex with father's occupational status. Results are given in Table 3. Across all measures of father's occupational status, there is a positive, significant correlation between respondent sex and occupational status of respondent father. This finding suggests, if indeed the General Social Surveys are probability samples of the U.S. population, that high-status fathers are more likely to have male offspring. Results for African Americans showed an interesting result in light of previous findings. Father's occupational status was correlated with sex of respondent, but only for the variable for father's occupational prestige (1980) and socioeconomic status (1980). This result suggests that African American males with high occupational status have only recently become more likely to have male offspring, perhaps because of relatively recent improvements in the general social status of African Americans. That is, in the earlier General Social Surveys, respondent fathers with high occupational status would probably have had lower social status (and income) than a non-African American with an equivalent occupation. In later General Social Surveys, respondent fathers with high occupational status may have been afforded more real status and income, hence the change in the effect on sex ratio of offspring.

Table 4 gives the results of the second test of the sex ratio hypothesis. In this test, percentage boys (of all biological children of the respondent) is regressed on the intelligence, SEI, and occupational prestige of the respondent. Results show that intelligence, SEI, and occupational prestige are significant, positive predictors of percentage boys for men only, not women (see also Figures 2, 3, and 4). This finding suggests that higher-status males are more likely to have boys than other males. The findings for women are the opposite, perhaps because these measures of status are better measures of male status in American society than female status. Also, women who have taken time off from a career to have children are less likely to be in high-status occupations. If these women are somewhat more likely to be (or have been) married to higher-status men, then this would account for the finding of a negative relationship between female occupational status and percentage boys among offspring. In fact, some of these women may have lower occupational status *because* they married high-status men, given the tradition of wives supporting their husbands' careers over their own.[2]

In sum, these two tests give substantial support for hypothesis 3. The sex ratio of offspring varies by status, with higher-status fathers having more boys among their biological offspring than lower-status fathers. This has only recently occurred for African American respondents, perhaps indicative of their recently improved status as a group within American society.

Table 4. 1994 GSS Regression of Percentage Boys among Biological Children on Respondent's Occupational Status

	Model 1	Model 2	Model 3
Sex (1= Male)	–21.315*	–23.031***	–31.474***
	(8.912)	(3.907)	(9.412)
Intelligence (number words correct)	–2.126*		
	(.870)		
Respondent's SEI 80		–.195**	
		(.079)	
Respondent's Prestige 80			–.227†
			(.142)
Interaction status by sex	2.891*	.394***	.625**
	(1.390)	(.121)	(.201)
R^2	.012	.014	.024
N	685	1034	705

* $p<.05$ ** $p<.01$ *** $p<.001$

Discussion and Conclusion

Evidence is mounting that biological factors play important roles in the process of investment in children within the family. In this article, I have shown how a well-known hypothesis from evolutionary biology can help explain differential investment in offspring by sex. This is the Trivers-Willard hypothesis, which suggests that high-status parents will invest more in boys, and low-status parents will invest more in girls. This investment may be physiological and affect sex ratios or financial and affect the allocation of parental resources. The analyses in this article lend support to the Trivers-Willard hypothesis in both its sex ratio and resource allocation forms.

The test of the resource allocation version of the Trivers-Willard hypothesis showed that when looking at educational attainment—arguably the greatest investment that American parents make in their children—results conformed to the predictions of Trivers-Willard.[3] There is an interaction between father's status and child's sex such that on average the educational benefit of having a high-status father is greater for boys than for girls. This result suggests that high-status fathers are more likely to invest in the education of sons than in the education of daughters. These results were significant and consistent across 28 years of General Social Surveys. Among African Americans, a group that

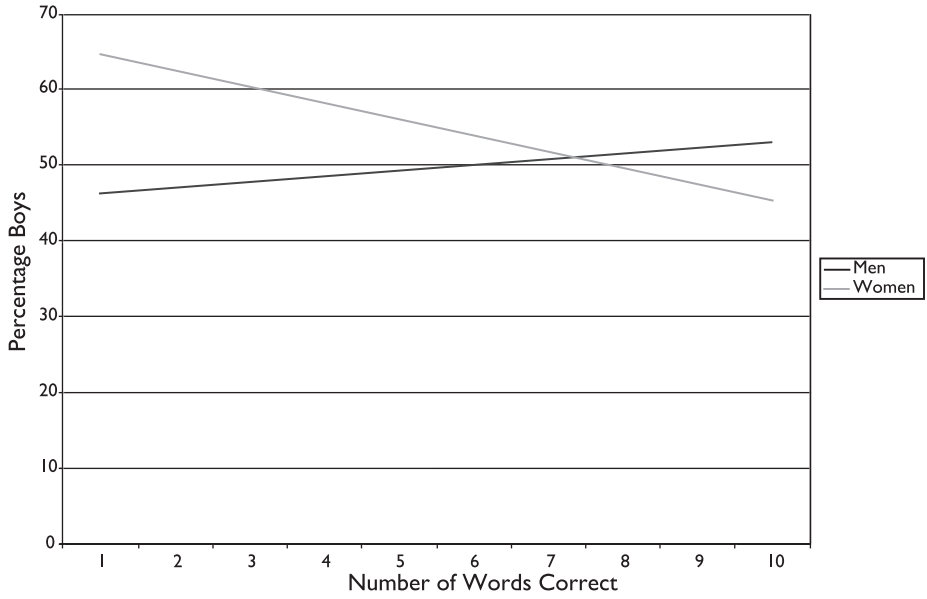

Figure 2. Percentage Boys among Biological Offspring, by Intelligence (Number of Words Correct)

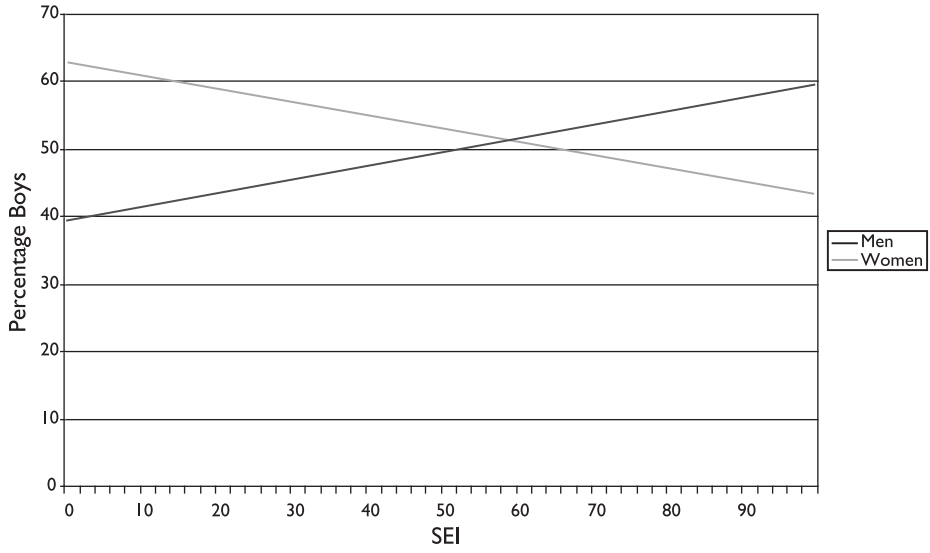

Figure 3. Percentage Boys among Biological Offspring, by SEI (80)

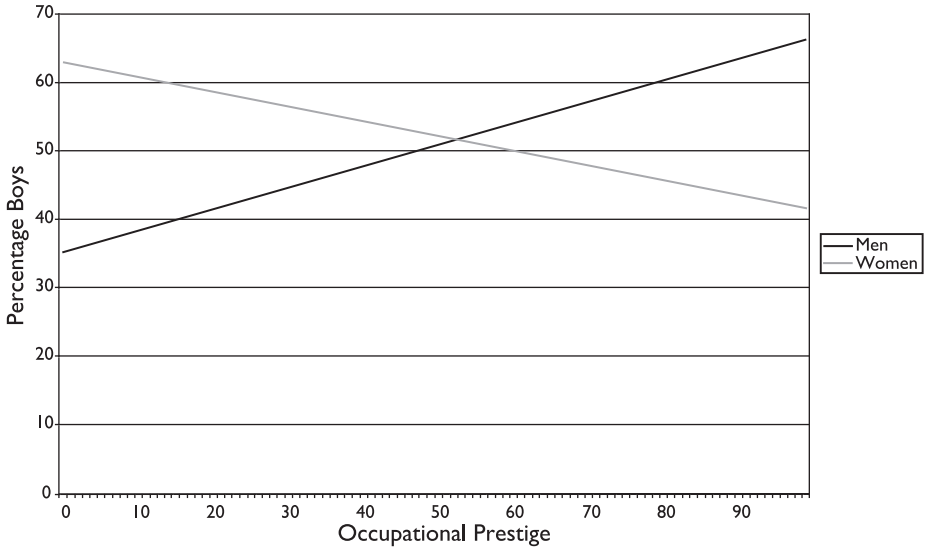

Figure 4. Percentage Boys among Biological Offspring, by Occupational Prestige (80)

has faced obstacles to upward status mobility in American society, this finding was reversed for the earlier samples. That is, in the early years of the survey, on average the educational benefit of having a high-prestige father was greater for girls than for boys.

These results suggest that there are class biases in investment in offspring in the contemporary U.S., with higher-status parents investing more in boys, and lower-status parents investing more in girls. Given that years of education is an indirect measure of parental investment that does not take into account factors such as quality or type of education, which also vary by gender, this may just be the tip of the iceberg of differential parental investment in offspring. Whether such differential parental investment is a conscious strategy or not is unclear, and arguably, unimportant. Previous results based on self-report data suggest that parents are not conscious of differentially investing in their offspring, at least at young ages. The primary drawback of this study—using years of education attained as the measure of parental investment—is in this respect also its greatest strength, as years of education attained is a measure of past behavior unlikely to be subject to reporting biases. However, the indirect nature of this measure of parental investment suggests that future analyses should examine more direct measures of parental investment in children's higher education such as parental provision of tangibles like money and goods and also parental provision of intangibles such as moral support and encouragement for higher education. It

is in determining who will receive our love and support that evolutionary theory can be most useful to sociologists (e.g., Daly and Wilson 1998).

Second, the analyses reported here also support the sex ratio version of the Trivers-Willard hypothesis. The results strongly suggest that in American society today, high-status males are more likely to have boys among their biological offspring. This finding suggests that, as the medical community has learned already, socially constructed factors such as social status and associated stress (or lack of it) can affect physiological processes. The hypothesized mechanism here is through the condition of the mother: the wives of high-status men may be assumed to be in better condition (on average) than the wives of lower-status men. The condition of the mother in turn affects her ability to carry a more fragile male fetus to term, and hence influences her probability of having a boy or girl.

For the sociology of the contemporary U.S., this article has shown how an evolutionary hypothesis (the Trivers-Willard hypothesis) can help both explain an important social process (educational attainment) and uncover social patterns previously undiscovered (the relationship between father's status and sex ratio of biological children). The interaction of sex of offspring with parental status on education attained was unclear from studies that looked only at the relationship between sex and education attained or the relationship between parental status and education attained. I argue that the contradictory results obtained so far are likely because of an interaction between sex and parental status on educational attainment, as well as differential sex ratios by parental status. For example, these findings can help explain the effect of sex composition of sibship on individual educational attainment. Conley (2000) finds that the presence of opposite sex siblings hurts the educational attainment of individuals. This may be in part because, in high-status families, there are proportionately more boys and also more investment in boys; and in low-status families, there are proportionately more girls and also more investment in girls. So, a boy with sisters is more likely to be from a lower-status family and receive less education; and a girl with brothers is more likely to be from a higher-status family and receive less education.

Similarly, status attainment research in the U.S. will benefit from attention to how the interaction of child's sex and father's status affect the education attained by the child. In general, attention to how sex differences in all kinds of investment in children differ by socioeconomic class of family of origin is likely to be a fruitful avenue of research for sociologists. For example, it is likely that families will encourage and support boys and girls in different career and educational aspirations, but how they do this will depend on class background.

It is important to note that these results are for U.S. society only and will be somewhat different in other societies with different educational institutions and means of status attainment. In U.S. society, Trivers-Willard type processes were revealed in years of education attained, but this is likely *not* to be the case in other societies where it is the *type* of education attained, rather than years of education

attained, that is the more important predictor of later social status (Kerckhoff 1995; Buchmann and Dalton 2002). Furthermore, considerations of social history also shape how Trivers-Willard type processes take place. For example, stratification by race has a history unique to the United States and is reflected in the pattern of results over time reported here for African Americans.

The larger point here is that the usefulness of any evolutionary hypothesis depends on an understanding of specific social and cultural contexts, which, together with evolved predispositions, produce observed social behaviors. This point is often lost in the debate over the relevance of evolutionary theory to the social sciences and in critics' accusation that the evolutionary theorists are practicing biological determinism and reductionism. Yet without a specific social context, almost all evolutionary hypotheses are of limited value. Humans are above all social beings and have evolved to thrive in a social setting (Boyer 2001:122). It seems that given their understanding of social and cultural contexts, sociologists are particularly well positioned to use evolutionary hypotheses to help explain social processes, as others have suggested (van den Berghe 1979; Nielsen 1994; Whitmeyer 1997; Lopreato and Crippen 1999; Sanderson 2001; Kanazawa 2001b).

Notes

1. Given this association between status and reproductive success in the evolutionary environment, individuals, especially males, may have evolved predispositions to compete for status, even if the original evolved reason for this predisposition (greater reproductive success) no longer holds. Evidence suggests that contemporary males on average do continue to compete for status and strive for dominance in a variety of arenas (Pratto 1996). Studies also suggest that females prefer high-status males (Langhorne and Secord 1955; Buss and Barnes 1986; Buss and Schmitt 1993) and that high-status males have greater frequency of sexual relations and more sexual partners than lower-status males (Pérusse 1993; Kanazawa 2003).

2. There is some evidence that first children are more likely to be male than later-borns (James 1971). However, this does not account for this finding, as when number of children is controlled the positive effect of status on percentage boys among biological offspring persists.

3. Cox (2003) found a similar result in more limited analysis of education by parental wealth.

References

Abernathy, Virginia, and Ray Yip. 1990. "Parent Characteristics and Sex Differential Infant Mortality: The Case in Tennessee." *Human Biology* 62:279–90.

Behrman, Jere R., Robert A. Pollak, and Paul Taubman. 1986. "Do Parents Favor Boys?" *International Economic Review* 27(1):33–54.

Bereczkei, Tamas, and R.I.M. Dunbar. 1997. "Female-Biased Reproductive Strategies in a Hungarian Gypsy Population." *Proceedings of the Royal Society of London, Series B: Biological Sciences* 264:17–22.

Betzig, Laura. 1993. "Sex, Succession and Stratification in the First Six Civilizations: How Powerful Men Reproduced, Passed Power on to Their Sons, and Used Power to Defend Their Wealth, Women and Children." Pp. 37–74 in *Social Stratification and Socioeconomic Inequality*. A Comparative Biosocial Analysis, Vol. 1, edited by Lee Ellis. Praeger.

Betzig, Laura, and Samantha Weber. 1995. "Presidents Preferred Sons." *Politics and the Life Sciences* 14:61–64.

Bianchi, Suzanne M., and John Robinson. 1997. "What Did You Do Today? Children's Use of Time, Family Composition, and the Acquisition of Social Capital." *Journal of Marriage and the Family* 59(2):332–44.

Biblarz, Timothy J., and Adrian E. Raftery. 1999. "Family Structure, Educational Attainment, and Socioeconomic Success: Rethinking the 'Pathology of Matriarchy'." *American Journal of Sociology* 105(2):321–65.

Blau, Peter M., and Otis Dudley Duncan. In collaboration with Andrea Tyree. 1967. *The American Occupational Structure.* Wiley.

Bond, Rod, and Peter Saunders 1999. "Routes of Success: Influences on the Occupational Attainment of Young British Males." *British Journal of Sociology* 50(2):217–49.

Borgerhoff Mulder, M. 1987. "Cultural and Reproductive Success: Kipsigis Evidence." *American Anthropologist*. 89:617–34.

———. 1988. "Reproductive Success in Three Kipsigis Cohorts." Pp. 419–35 in *Reproductive Success: Studies of Individual Variation in Contrasting Breeding Systems,* edited by T. H. Clutton-Brock. University of Chicago Press.

———. 1998. "Brothers and Sisters: How Sibling Interactions Affect Optimal Parental Allocations." *Human Nature* 9:119–62.

Bowles, Samuel, and Herbert Gintis. 2002. "Schooling in Capitalist America Revisited." *Sociology of Education* 75(1):1–18.

Boyer, Pascal. 2001. *Religion Explained*. Basic Books.

Breen, Richard, and John H. Goldthorpe. 2002. "Merit, Mobility, and Method: Another Reply to Saunders." *British Journal of Sociology* 53(4):575–82.

Buchmann, Claudia, and Ben Dalton. 2002. "Interpersonal Influences and Educational Aspirations in 12 Countries: The Importance of Institutional Context." *Sociology of Education* 75(2):99–122.

Buss, David M. 1999. *Evolutionary Psychology*. Boston: Allyn & Bacon.

Buss, David M., and Michael F. Barnes. 1986. "Preferences in Human Mate Selection." *Journal of Personality and Social Psychology* 50:559–70.

Buss, David M., and David P. Schmitt. 1993. "Sexual Strategies Theory: An Evolutionary Perspective on Human Mating." *Psychological Review* 100:204–32.

Butcher, Kristin F., and Anne Case. 1994. "The Effect of Sibling Sex Composition on Women's Education and Earnings." *The Quarterly Journal of Economics* 109(3):531–63.

Case, Anne, I-Fen Lin, and Sara McLanahan. 2001. "Educational Attainment of Siblings in Stepfamilies." *Evolution and Human Behavior* 22:269–89.

Casimir, Michael J., and Rao Aparna. 1995. "Prestige, Possessions and Progeny: Cultural Goals

and Reproductive Success among the Bakkarwal." *Human Nature* 6(3):241–72.

Catalano, Ralph A. 2003. "Sex Ratios in the Two Germanies: A Test of the Economic Stress Hypothesis." *Human Reproduction* 18(9):1972–75.

Chacon-Puignau, Grace Cristina, and Klaus Jaffe. 1996. "Sex Ratio at Birth Deviations in Modern Venezuela: The Trivers-Willard Effect." *Social Biology* 43:257–70.

Chagnon, Napoleon A., Mark V. Flinn, and Thomas F. Melancon, 1979. "Sex-Ratio Variation among the Yanomamö Indians." Pp. 290–320 in *Evolutionary Biology and Human Social Behavior: An Anthropological Perspective,* edited by N. A. Chagnon and William Irons. Duxbury Press.

Chen, Zeng-Yin, and Howard B. Kaplan. 2003. "School Failure in Early Adolescence and Status Attainment in Middle Adulthood: A Longitudinal Study." *Sociology of Education* 76(2):110–27.

Clutton-Brock, T. H., S. D. Albon, and F. E. Guinness. 1984. "Maternal Dominance, Breeding Success and Birth Sex Ratios in Red Deer." *Nature* 308:358–60.

Cohen, Cathy J., and Claire E. Nee. 2000. "Educational Attainment and Sex Differentials in African American Communities." *American Behavioral Scientist* 43:1159–1206.

Conley, Dalton. 2000. "Sibship Sex Composition: Effects on Educational Attainment." *Social Science Research* 29:1441–57.

———. 2001. "Capital for College: Parental Assets and Postsecondary Schooling." *Sociology of Education* 74(1):59–72.

———. 2004. *The Pecking Order*. Pantheon Books.

Correll, Shelley J. 2001. "Gender and the Career Choice Process: The Role of Biased Self-Assessments." *American Journal of Sociology* 106(6):1691–1730.

———. 2004. "Gender, Status and Emerging Career Aspirations." *American Sociological Review* 69(1):93–113.

Cosmides, Leda, John Tooby, and Jerome H. Barkow. 1992. "Introduction: Evolutionary Psychology and Conceptual Integration." Pp. 3–15 in *The Adapted Mind,* edited by Jerome H. Barkow, Leda Cosmides, and John Tooby.

Cox, Donald. 2003. "Private Transfers within the Family: Mothers, Fathers, Sons, and Daughters." Pp. 168–217 in *Death and Dollars: The Role of Gifts and Bequests in America*, edited by Alicia Munnell and Annika Sundén. Brookings Institution Press.

Cronk, Lee. 1989. "Low Socioeconomic Status and Female-Biased Parental Investment: The Mukogodo Example." *American Anthropologist* 91:414–17.

———. 1991. "Intention Versus Behavior in Parental Sex Preferences among the Mukogodo of Kenya." *Journal of Biosocial Science* 23:229–40.

———. 1993. "Parental Favoritism Toward Daughters." *American Scientist* 81:272–79.

———. 2000. "Female-Biased Parental Investment and Growth Performance among the Mukogodo." Pp. 203–21 in *Adaptation and Human Behavior: An Anthropological Perspective,* edited by Lee Cronk, Napoleon Chagnon, and William Irons. Aldine de Gruyter.

Crosnoe, Robert, Rashmita S. Mistry, and Glen H. Elder, Jr. 2002. "Economic Disadvantage, Family Dynamics and Adolescent Enrollment." *Journal of Marriage and the Family* 64(3):690–702.

Cziko, Gary. 2000. *The Things We Do: Using The Lessons of Bernard and Darwin to Understand*

the What, How, and Why of Our Behavior. MIT Press.

Daly, Martin, and Margo Wilson. 1998. *The Truth about Cinderella. A Darwinian View of Parental Love.* Yale University Press.

Davis, James Allan, and Tom W. Smith. 1998. General Social Surveys 1972–1998. Principal Investigator: James A. Davis; Director and Co-Principal Investigator, Tom W. Smith; Co-Principal Investigator, Peter V. Marsden, NORC ed. Chicago: National Opinion Research Center, producer, 1998; Storrs, CT: The Roper Center for Public Opinion Research, University of Connecticut, distributor.

Downey, Douglas B. 1995. "When Bigger is Not Better: Family Size, Parental Resources, and Children's Educational Performance." *American Sociological Review* 60:746–61.

Dunn, Judy, and Robert Plomin. 1990. *Separate Lives: Why Siblings Are So Different.* Basic Books.

Ellis, Lee, and Steven Bonin. 2002. "Social Status and the Secondary Sex Ratio: New Evidence on a Lingering Controversy." *Social Biology* 49:35–43.

Essock-Vitale, Susan M. 1984. "The Reproductive Success of Wealthy Americans" *Ethology and Sociobiology* 5(1)45–49

Fox, John. 1991. *Regression Diagnostics. An Introduction*. Sage University Paper Series on Quantitative Applications in the Social Sciences, 07-079. Sage.

Freese, Jeremy, and Brian Powell. 1999. "Sociobiology, Status and Parental Investment in Sons and Daughters: Testing the Trivers-Willard Hypothesis." *American Journal of Sociology* 104(6):1704–43.

Gaulin, Steven J., and Carole J. Robbins. 1991. "Trivers-Willard Effect in Contemporary North American Society." *American Journal of Physical Anthropology* 85:61–69.

Gibson, Mhairi A., and Ruth Mace. 2003. "Strong Mothers Bear More Sons in Rural Ethiopia." *Biology Letters* (Proceedings of the Royal Society Supplement Online) May 20.

Gould, Steven J. 1997. "Darwinian Fundamentalism." *New York Review of Books* 12:34–37.

Grabowski, Lori J. Schabo, Kathleen Thiede Call, and Jeylant T. Mortimer. 2001. "Global and Economic Self-Efficacy in the Educational Attainment Process." S*ocial Psychology Quarterly* 64(2):164–79.

Hauser, Robert M., and David L. Featherman. 1977. *The Process of Stratification: Trends and Analyses.* Academic Press.

Hauser, Robert M., and Peter A. Mossel. 1985. "Fraternal Resemblance in Educational Attainment and Occupational Status." *American Journal of Sociology* 91(3):650–73.

Hill, J. 1984. "Prestige and Reproductive Success in Man." *Ethology and Sociobiology* 5:77–95.

Hrdy, Sarah. 2000. *Mother Nature: Maternal Instincts and How They Shape the Human Species.* Ballantine Books.

Irons, William. 1979. "Cultural and Biological Success" Pp. 257–72 in *Evolutionary Biology and Human Social Behavior: An Anthropological Perspective,* edited by N. A. Chagnon and William Irons. Duxbury Press.

Jacobs, Jerry A. 1996. "Gender Inequality and Higher Education." *Annual Review of Sociology* 22:153–85.

Jacobs, Jerry A., David Karen, and Katherine McClelland. 1991. "The Dynamics of Young Men's Career Aspirations." *Sociological Forum* 6(4):609–39.

James, William H. 1971. "Cycle Day of Insemination, Coital Rate, and Sex Ratio." *Lancet* 16:112–14.

Jencks, Christopher et. al. 1979. *Who Gets Ahead? The Determinants of Economic Success in America*. Basic Books.

Judge, Debra S., and Sarah B. Hrdy. 1992. "Allocation of Accumulated Resources among Close Kin: Inheritance in Sacramento, California 1890–1984." *Ethology and Sociobiology* 13:495–522.

Kaestner, Robert. 1997. "Are Brothers Really Better? Sibling Sex Composition and Educational Achievement Revisited." *Journal of Human Resources* 32(2):250–84.

Kanazawa, Satoshi. 2001a. "Comment: Why We Love Our Children." *American Journal of Sociology* 106(6):1761.

———. 2001b. "De Gustibus Est Disputandum." *Social Forces* 79(3):1131–62

———. 2003. "Can Evolutionary Psychology Explain Reproductive Behavior in the Contemporary United States?" *Sociological Quarterly* 44(2):291–301.

Keister, Lisa. 2000. "Race and Wealth Inequality: The Impact of Racial Differences in Asset Ownership on the Distribution of Household Wealth." *Social Science Research* 29(4):477–502

Keller, Matthew C., Randolph M. Nesse, and Sandra Hofferth. 2001. "The Trivers-Willard Hypothesis of Parental Investment. No Effect in the Contemporary United States." *Evolution and Human Behavior* 22:343–60.

Kerckhoff, Alan C. 1995. "Institutional Arrangements and Stratification Processes in Industrial Societies." *Annual Review of Sociology* 15:323–47.

Kerckhoff, Alan C., Richard T. Campbell, Jerry M. Trott, and Vered Kraus. 1989. "The Transmission of Socioeconomic Status and Prestige in Great Britain and the United States." *Sociological Forum* 4(2):155–77.

Kerckhoff, Alan C., Stephen W. Raudenbush, Elizabeth Glennie. 2001. "Education, Cognitive Skill, and Labor Force Outcomes." *Sociology of Education*, 74(1):1–24.

Koziel, Slawomir, and Stanley J. Ulijaszek. 2001. "Waiting for Trivers and Willard: Do the Rich Really Favor Sons?" *American Journal of Physical Anthropology* 115(1):71–79.

Langhorne, Maurice C., and Paul F. Secord. 1955. "Variations in Marital Needs with Age, Sex, Marital Status, and Regional Composition." *Journal of Social Psychology* 41:19–37.

Lévi-Strauss, Claude. 1955. *Tristes Tropiques*. Librairie Plon.

Lopreato, Joseph, and Timothy Crippen. 1999. *Crisis in Sociology: The Need for Darwin*. Transaction Publishers.

Lorber, Judith. 1993. "Believing Is Seeing: Biology as Ideology." *Gender and Society* 7(6):568–81.

Marks, Jonathan. 2002. *What It Means To Be 98% Chimpanzee: Apes, People, and Their Genes*. University of California Press.

Marleau, Jacques D., and Jean-François Saucier. 2000. "Pregnant Women's Social Status, Stress, Self Esteem and Their Infants' Sex Ratio at Birth." *Perceptual and Motor Skills* 91(1):697–703.

Maryanski, Alexandra, and Jonathan H. Turner. 1992. *The Social Cage: Human Nature and the Evolution of Society.* Stanford University Press.

Mueller, Ulrich. 1993. "Social Status and Sex." *Nature* 363(10):490.

Nielsen, Francois. 1994. "Sociobiology and Sociology." *Annual Review of Sociology* 20:267–303.

Oppenheimer, Valerie Kincade. 2000. "The Continuing Importance of Men's Economic Position in Marriage Formation." Pp. 283–301 in *The Ties that Bind: Perspectives on Marriage and Cohabitation,* edited by Linda J. Waite et. al. Aldine de Gruyter.

Pérusse, D. 1993. "Cultural and Reproductive Success in Industrial Societies: Testing the Relationship at the Proximate and Ultimate Levels. *Behavioral and Brain Sciences* 16:267–322.

Pratto, Felicia. 1996. "Sexual Politics: The Gender Gap in the Bedroom, the Cupboard, and the Cabinet." Pp. 179–230 in *Sex, Power and Conflict,* edited by David M. Buss and Neil M. Malamuth. Oxford University Press.

Rose, Hilary, and Steven Rose, eds. 2000. *Alas, Poor Darwin. Arguments Against Evolutionary Psychology.* Harmony Books.

Rosen, Bernard C., and Carol S. Aneshensel. 1978. "Sex Differences in the Educational-Occupational Expectation Process." *Social Forces* 57(1):164–86.

Rytina, Steven. 2000. "Is Occupational Mobility Declining in the U.S.?" *Social Forces* 78(4):1227–76.

Sanderson, Stephen K. 2001. *The Evolution of Human Sociality: A Darwinian Conflict Perspective*. Rowman & Littlefield.

Smith, Martin S., Bradley J. Kish, and Charles B. Crawford. 1987. "Inheritance of Wealth as Human Kin Investment." *Ethology and Sociobiology* 8:171–82.

Smith, Thomas E. 1991. "Agreement of Adolescent Educational Expectations with Perceived Maternal and Paternal Educational Goals." *Youth and Society* 23(2):155–74.

Steelman, Lala Carr, and Brian Powell. 1989. "Acquiring Capital for College: The Constraints of Family Configuration." *American Sociological Review* 54(5):844–55.

———. 1991. "Sponsoring the Next Generation: Parental Willingness to Pay for Higher Education." *American Journal of Sociology* 96(6):1505–29.

Teachman, Jay D., and Kathleen Paasch. 1998. "The Family and Educational Aspirations." *Journal of Marriage and the Family* 60(3):704–14.

Tooby, John, and Leda Cosmides. 1990. "The Past Explains the Present: Emotional Adaptations and the Structure of Ancestral Environments." *Ethology and Sociobiology* 11:375–424.

———. 1992. "The Psychological Foundations of Culture." Pp. 19–136 in *The Adapted Mind: Evolutionary Psychology and the Generation of Culture,* edited by Jerome H. Barkow, Leda Cosmides, and John Tooby. Oxford University Press.

Treiman, Donald J. 2001. "Occupations, Stratification, and Mobility" Pp. 297–313 in *The Blackwell Companion to Sociology,* edited by Judith R. Blau. Blackwell.

Trivers, Robert L. 1972. "Parental Investment and Sexual Selection " Pp. 136–79 in *Sexual Selection and the Descent of Man, 1871–1971,* edited by Bernard Campbell. Aldine.

Trivers, Robert L. and Dan E. Willard. 1973. "Natural Selection of Parental Ability to Vary the Sex Ratio of Offspring." *Science* 179:90–92.

Turke, Paul, and Laura Betzig. 1985. "Those Who Can Do: Wealth, Status, and Reproductive Success on Ifaluk." *Ethology and Sociobiology* 6:79–87.

van den Berghe, Pierre. 1979. *Human Family Systems: An Evolutionary View*. Waveland Press.

Vining, Daniel R. 1986. "Social versus Reproductive Success: The Central Theoretical Problem of Human Sociobiology." *Behavioral and Brain Sciences* 9(1):167–87.

Whitmeyer, Joseph M. 1997. "Endogamy as a Basis for Ethnic Behavior." *Sociological Theory* 15(2):162–78.