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AN EMPIRICAL TEST OF A POSSIBLE SOLUTION TO "THE CENTRAL THEORETICAL PROBLEM OF HUMAN SOCIOBIOLOGY"*

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Abstract. KANAZAWA (2004) suggests that there is a negative association between social class and reproduction because lower-class individuals, who tend to have lower general intelligence, have greater difficulty employing evolutionarily-novel modern contraception. I derive three hypotheses from KANAZAWA's theory: 1) There are no class differences in the number of *desired* children; 2) The effect of sexual activity on reproduction is weaker among the more intelligent; and 3) The interaction between sexual activity and intelligence is stronger among men. The analyses of the U.S. General Social Surveys support all three hypotheses.

Keywords: general intelligence, the Savanna Principle, fertility, class differences, dysgenics

Modern evolutionary psychology predicts that, because women prefer to mate with men with greater resources and higher status, such men attain greater reproductive success (BUSS 1994). Throughout human history, wealthy and powerful men of high status have had a greater number of mates and produced more children than poor and powerless men of low status (BETZIG 1986). In ancient civilizations, kings, emperors and sultans maintained large harems, consisting of hundreds and thousands of virgins, and local chiefs and noblemen kept several wives or concubines, while countless poor men in the countryside died mateless and childless (BETZIG 1993). And these wealthy and powerful men of high status often left a large number of descendants.

In contrast, a strong positive correlation between social class and reproduction does not exist in the contemporary society. Marriage and successful reproduction are no longer the privilege of the wealthy and powerful only, and men's reproductive success is not related to social class. If anything, the correlation appears negative; in contemporary industrial societies like the United States, poor families tend to have more children than wealthy families. This is in contradiction to the prediction of evolutionary psychology.

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Much more than an empirical correlation or its absence is at stake, however. Critics of evolutionary psychology point to this lack of strong positive correlation between social class and reproductive success (predicted by evolutionary psychology) to question its applicability to contemporary society, calling it "the central theoretical problem of human sociobiology" (VINING 1986).[1] If evolutionary psychology cannot predict the reproductive behavior of men and women in modern industrial societies, then it undermines evolutionary psychology's claim to provide a general theoretical perspective for all social and behavioral sciences (BUSS 1995).

This theoretical problem has been solved at one level, however. PÉRUSSE (1993) and KANAZAWA (2003) demonstrate, with Canadian and American data, respectively, that wealthier men copulate more frequently and have more sex partners than less wealthy men. Evolution by natural and sexual selection equips organisms, not necessarily with the ability to attain reproductive success as the ultimate goal, but with the proximate desires and preferences to motivate behavior which, in the context of the environment of evolutionary adaptedness (EEA), would have led to greater reproductive success. The desire for copulation and, in the case of males, for greater sexual variety are such proximate desires. Since there were no effective means of contraception in the EEA, other than abstinence, men who copulated more frequently and had more sex partners necessarily had more children. What creates the "central theoretical problem in human sociobiology" is the intervention of a cumbersome modern invention called effective contraception.

However, this solution of the problem simply begs the question: Why is it that men with greater resources and of higher status use contraception more effectively than those with fewer resources and of lower status? Why do the former end up with fewer children than the latter when they have more sex partners and copulate more frequently?

KANAZAWA's (2004) theory of the evolution of general intelligence suggests one potential solution. The human mind consists of numerous domain-specific adaptations to solve recurrent adaptive problems. In this sense, our ancestors did not really have to think, in order to solve such recurrent problems. Evolution has already done all the thinking, so to speak, and equipped the human brain with the appropriate psy-

[1] Of course, evolutionary psychology is entirely different from sociobiology (BUSS 1995, pp. 9–10; SYMONS 1992). The negative correlation between social class and reproduction is a problem only for sociobiology, which studies observable human behavior and inclusive fitness (measured, among others, by fertility), not for evolutionary psychology, which studies evolved psychological mechanisms in the brain, and preferences, values, cognitions and emotions that they engender. Strictly speaking, evolutionary psychology does not predict a positive correlation between social class and fertility, which is observable behavior, not an evolved psychological mechanism. While I believe that the distinction between evolutionary psychology and sociobiology is very important, I will not pursue this line of argument in this paper. I will instead provide an evolutionary psychological solution to the central theoretical problem of human sociobiology.

chological mechanisms, which engender preferences, desires, cognitions, and emotions, and motivate adaptive behavior in the context of the EEA.

Even in the extreme continuity and constancy of the EEA, however, there were occasional problems that were evolutionarily novel and nonrecurrent, which required our ancestors to think and reason, deductively and inductively, in order to solve. To the extent these evolutionarily-novel, nonrecurrent problems happened frequent enough in the EEA (different problem each time) and had serious enough consequences for survival and reproduction, then any genetic mutation that allowed its carrier to think and reason would have been selected for, and what we now call general intelligence could have evolved as a domain-specific adaptation for solving evolutionarily-novel, nonrecurrent problems. KANAZAWA (2004) suggests that general intelligence has become universally important in modern life (GOTTFREDSON 1997; HERRNSTEIN and MURRAY 1994; JENSEN 1998) only because our current environment is almost entirely evolutionarily novel. He then derives, and empirically supports, a hypothesis that intelligent (high-*g*) individuals are better than less intelligent (low-*g*) individuals at solving problems *only if* they are evolutionary novel, and that intelligent individuals are *no better* than less intelligent individuals in solving evolutionarily-familiar problems, such as those in the domains of mating, parenting, interpersonal relationships, and wayfinding.

While mating is evolutionarily familiar, voluntary control of fertility through artificial means of contraception (such as condoms and the pill) is evolutionarily novel. In the EEA, our ancestors mated regularly, with pregnancy and lactation serving as natural means of contraception. As a result, our ancestors probably produced a larger number of offspring than we do today, but many of them died in infancy due to infectious diseases, malnutrition and other natural causes (including predation by humans and other animals). The average number of offspring surviving to sexual maturity in the EEA may not have been much larger than it is today. At any rate, voluntary control of fertility through artificial means of contraception was not practiced in the EEA.

This is not the case today. Since advanced industrial nations have very low infant mortality rates, if people did not practice voluntary control of fertility, they would all end up with 10 or 20 children. For the first time in human history, we cannot rely on natural means to control fertility; we have to do it ourselves. This is evolutionarily novel; thus KANAZAWA's (2004) theory would predict people with greater general intelligence to do it more effectively than those with less general intelligence. More intelligent men attain higher status and greater resources, and therefore occupy higher social classes (FRYER 1922; HARRELL and HARRELL 1945; JENCKS 1972, pp. 220–221; JENSEN 1980, pp. 340–341). KANAZAWA (2004) suggests that this may be why men in higher social classes, who are more intelligent, practice contraception more effectively and contribute to the inverse relationship between social class and

reproduction, despite their greater frequencies of copulation and larger number of mates.

Several empirical implications follow from KANAZAWA's (2004) solution of the central theoretical problem of human sociobiology. First, if the negative correlation between social class and fertility results from lower-class individuals' difficulty (due to their lower general intelligence) with employing evolutionarily-novel means of artificial birth control effectively, then social class should not be related to how many children individuals *desire* or *plan* to have, only with how many children they *actually end up having*.[2] While lower-class individuals may in fact have a larger number of children, they should not necessarily want or desire to have a larger number of children than individuals in middle and upper classes.

H_1: While lower-class families have a larger number of children than middle- and upper-class families (the central theoretical problem of human sociobiology), lower-class families do not desire or plan to have a larger number of children than middle- and upper-class families.

Second, if less intelligent individuals have larger numbers of children as a result of their difficulty with employing evolutionarily-novel means of artificial contraception, then their fertility should be a more direct function of sexual activity than that of more intelligent individuals. For instance, the number of sexual partners (as a measure of sexual activity) should have a greater effect on the number of children among less intelligent individuals than among more intelligent individuals.

H_2: The number of sexual partners has a greater effect on the number of children among the less intelligent than among the more intelligent.

Of course, due to the sexual asymmetry in reproductive biology, it is easier for men to increase their reproductive success with the number of sexual partners than it is for women. If a man has 100 sexual partners in a year, he can potentially produce 100 children (or more, if there are multiple births). In sharp contrast, if a woman has 100 sexual partners in a year, then she can still only produce one child at the end of the year (barring a multiple birth). Thus the interaction effect between the number of sex partners and general intelligence (hypothesized in H_2) should be stronger among men than among women.

[2] I owe this to LISA M. DEBRUINE.

H_3: The interaction effect between the number of sex partners and general intelligence (hypothesized in H_2) on the number of children is stronger among men than among women.

I will test these three hypotheses with the United States General Social Survey (1972–2000).

EMPIRICAL TEST

Data

The National Opinion Research Center at the University of Chicago has administered the General Social Surveys (GSS) either annually or biennially since 1972. Personal interviews are conducted with a nationally representative sample of non-institutionalized adults in the U.S. The sample size is about 1,500 for each annual survey, and about 3,000 for each biennial one. The exact questions asked in the survey vary by the year.

Hypothesis 1

One-way analysis of variance (ANOVA) of the number of children the GSS respondents have by their subjective social class (1 = lower class; 2 = working class; 3 = middle class; 4 = upper class) confirms the existence of the "central theoretical problem of human sociobiology"; lower-class respondents have significantly more children than respondents in working, middle and upper classes ($F_{3,38999} = 76.934$, $p < .0001$).

In two surveys (in 1988 and 1994), the GSS asks its respondents the following question: "All in all, what do you think is the ideal number of children for a family to have?" I use the respondents' response to this question as an admittedly somewhat oblique measure of their desired number of children. Consistent with Hypothesis 1, there are no class differences in the number of desired children ($F_{3,2625} = 1.985$, *ns*).

Multivariate analyses presented in *Table 1* confirm the bivariate analyses in one-way ANOVA. Column (1) in the left column shows that, controlling for age, race (1 = black), sex (1 = male), years of formal education, whether the respondent has ever been married (1 = yes), and religion (measured by four dummy variables: Catholic, Protestant, Jewish, and Other, with None as the reference category), social class has a strongly negative ($p < .0001$) effect on the number of children. Net of the effects of these demographic variables, lower-class respondents have a statistically significantly larger number of children than their middle- and upper-class counterparts.

Table 1. Effects of Social Class on the Number of Children and the Number of Desired Children

	(1) Number of Children	(2) Number of Desired Children
Social class	–.0504***	.0024
	(.0104)	(.0254)
Age	.0194***	.0052***
	(.0005)	(.0012)
Race (1 = black)	.5622***	.2951***
	(.0239	(.0580)
Sex (1 = male)	–.1086***	.0056
	(.0161)	(.0366)
Education	–.0804***	–.0325***
	(.0027)	(.0065)
Ever married (1 = yes)	1.6297***	–.0931†
	(.0223)	(.0492)
Religion		
Catholic	.2767***	.3243***
	(.0310)	(.0715)
Protestant	.1503***	.1379*
	(.0288)	(.0669)
Jewish	–.0184	–.0164
	(.0615)	(.1576)
Other	–.0251	.3428**
	(.0613)	(.1157)
Constant	.7255	2.5981
	(.0551)	(.1271)
R^2	.2659	.0453
Number of cases	38,908	2,628

Note: Main entries are unstandardized regression coefficients. Numbers in parentheses are standard errors.
† $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .0001$.

In contrast, Column (2) in the right column shows that, controlling for the same demographic variables, social class has absolutely no effect on the number of *desired* children ($p > .9$). The data presented in *Table 1* strongly support Hypothesis 1.

I express and test Hypothesis 1 in terms of social class, and not in terms of general intelligence, as in Hypotheses 2 and 3 below, because the "central theoretical problem of human sociobiology" (VINING 1986), which I seek to resolve once and for all in this paper, is expressed in terms of social class. However, the empirical pattern is the same whether I use general intelligence or social class.

The GSS measures the respondent's verbal intelligence by asking them to select a synonym for a word out of five candidates for ten different words. The measure of

verbal intelligence thus varies from 0 to 10. While verbal intelligence is strictly speaking not the same as general intelligence, it is a very strong correlate and indicator of general intelligence; in fact, this very measure of verbal intelligence in the GSS is frequently used in intelligence research (HUANG and HAUSER 1998).

Consistent with my assumption, there is a monotonic and statistically significant positive relationship between social class and intelligence. The means of the GSS verbal intelligence scores are: 4.68 for lower class (n = 1,021), 5.59 for working class (n = 9,206), 6.47 for middle class (n = 9,268), and 6.69 for upper class (n = 643); $F_{(3,20134)} = 426.59$, $p < .0001$, $\eta = .2445$, $r = .2396$, $p < .0001$. The correlation remains statistically significant even after controlling for education ($r = .1150$, $p < .0001$). Social class is therefore a statistically significant (if somewhat oblique) correlate of intelligence.

The analysis shows that the more intelligent the GSS respondents are, the higher the correlation between the desired number of children and the actual number of children. The correlation ranges from –.1533 among respondents who scored 0 on the verbal intelligence test to .3811 among those who scored 10. The correlation between verbal intelligence score, on the one hand, and the correlation between the number of desired children and the actual number of children, on the other, is moderately positive ($r = .3099$), but is not statistically significant due to an extremely small sample size (n = 11 score categories).

Hypothesis 2

The GSS measures the lifetime number of heterosexual partners that the respondent has had with the following question: "Now thinking about the time since your 18th birthday (including the past 12 months) how many male [female] partners have you had sex with?" Equation (1) in *Table 2* shows that, controlling for the same demographic variables as before, the lifetime number of sex partners has a marginally significantly ($p < .10$) positive main effect, and verbal intelligence has a significantly ($p < .01$) negative main effect, on the number of children. More importantly, however, it shows that the interaction effect between the lifetime number of sex partners and verbal intelligence is significantly ($p < .01$) *negative*. It means that, consistent with Hypothesis 2, the positive effect of the lifetime number of sex partners on the number of children becomes significantly *weaker* as the respondent's intelligence increases.

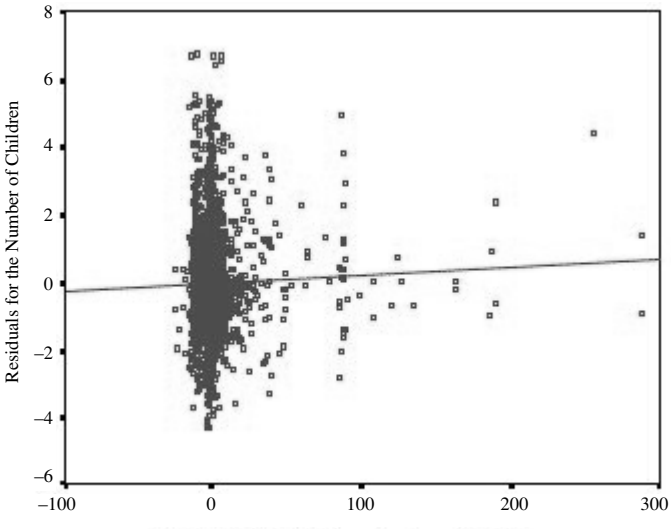
Figure 1 presents the partial effect of the lifetime number of sex partners on the number of children separately for the less and more intelligent. The residual plot in the top panel presents the partial relationship among the respondents whose verbal intelligence is below the median (= 6). The scatterplot shows that the relationship is

Table 2. Interactive Effects of Intelligence and Lifetime Number of Sex Partners on the Number of Children

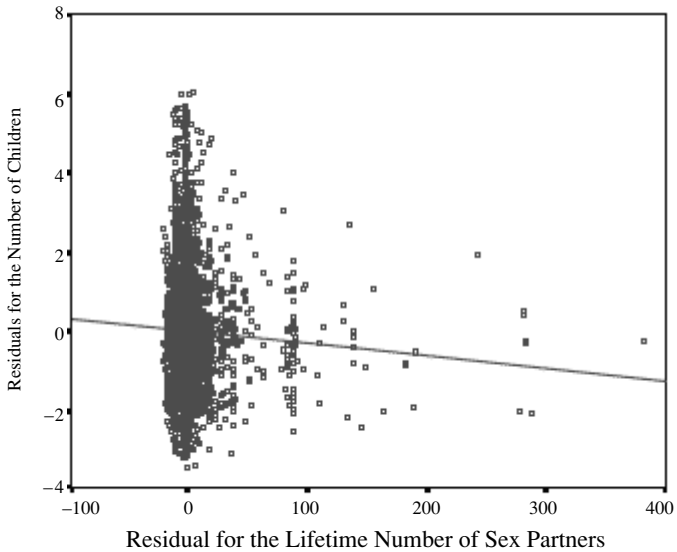
	Number of children		
	(1)	(2)	(3)
	All respondents	Men	Women
Lifetime number of sex partners	.0043† (.0023)	.0054* (.0023)	.0163 (.0119)
Verbal intelligence	–.0241** (.0091)	–.0152 (.0130)	–.0175 (.0135)
Interaction	–.0009** (.0003)	–.0011** (.0003)	–.0030† (.0017)
Age	.0244**** (.0010)	.0286**** (.0015)	.0214**** (.0014)
Race (1 = black)	.6139**** (.0495)	.4825**** (.0771)	.6425**** (.0652)
Sex (1 = male)	–.1566**** (.0321)	----------	----------
Education	–.0611**** (.0063)	–.0342**** (.0086)	–.0894**** (.0090)
Ever married (1 = yes)	1.4147**** (.0403)	1.4919**** (.0549)	1.3181**** (.0582)
Religion			
Catholic	.2102*** (.0545)	.2414*** (.0704)	.1528† (.0830
Protestant	.0348 (.0499)	.0662 (.0634)	–.0218 (.0769)
Jewish	–.0720 (.1135)	.0253 (.1520)	–.1768 (.1651)
Other	–.0314 (.1043)	–.0045 (.1357)	–.1033 (.1562)
R^2	.3031	.3655	.2543
Number of cases	8,252	3,500	4,752

Note: Main entries are unstandardized regression coefficients. Numbers in parentheses are standard errors.
† $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$; **** $p < .0001$.

positive, albeit statistically nonsignificant ($b = .0024$, $p < .12$). The bottom panel shows that the same partial relationship among the respondents whose verbal intelligence is above the median is actually significantly *negative* ($b = –.0032$, $p < .001$). *Among the more intelligent, the more sex partners they have in their lifetime, the fewer children they have*. This is consistent with KANAZAWA's (2004) hypothesis that general intelligence allows individuals to deal with evolutionarily-novel stimuli such as modern contraception more efficiently. The data presented in *Table 2,* Column (1), and *Figure 1* support Hypothesis 2.



a) Among the Less Intelligent



b) Among the More Intelligent

Figure 1. Partial Effect of the Lifetime Number of Sex Partners on the Number of Children

Hypothesis 3

Table 2, Columns (2) and (3) reestimate the model presented in Column (1) separately for men and women. Column (2) shows that the interaction effect between the lifetime number of sex partners and verbal intelligence among men remains significantly negative ($p < .01$) as in the sample of all respondents. In contrast, the same interaction effect is only marginally significantly negative ($p < .10$) among women. The sexually dimorphic pattern in the strength of the interaction effect between the lifetime number of sex partners and verbal intelligence on the number of children, where it is much stronger among men than among women, supports Hypothesis 3.

DISCUSSION

KANAZAWA (2004) speculates that the "central theoretical problem of human sociobiology" (VINING 1986) exists, and there is a negative correlation between social class and fertility, despite the positive correlation between social class and sexual activities (KANAZAWA 2003; PÉRUSSE 1993), because lower-class individuals have more difficulty dealing with evolutionarily-novel modern contraception because of their lower general intelligence. The analyses of data from the U.S. General Social Surveys presented in this paper support this explanation. First, while there is a negative association between social class and the number of children, there are no class differences in the number of *desired* children, as predicted in Hypothesis 1. Second, the interaction effect between the lifetime number of sex partners and verbal intelligence is significantly negative, as predicted in Hypothesis 2 and suggesting that the effect of sexual activity on reproduction differs by intelligence. In fact, while the lifetime number of sexual partners increases the number of children among the less intelligent (albeit nonsignificantly), it significantly *decreases* the number of children among the more intelligent. Finally, consistent with the sexual asymmetry in the reproductive biology and as predicted in Hypothesis 3, the interaction effect between the lifetime number of sex partners and verbal intelligence is much stronger among men than among women.

There are several important limitations of the current study. Theoretically, the validity of the empirical test rests on a sequence of four assumptions: 1. Individuals in higher classes have greater general intelligence than individuals in lower classes. 2. Individuals with greater general intelligence can employ evolutionarily-novel means of modern contraception more effectively than individuals with lesser general intelligence. 3. Individuals who use modern contraception more effectively can better control fertility voluntarily than individuals who use it less effectively. There is sufficient empirical evidence for Assumptions 1 and 3, but, to the best of my

knowledge, there is no empirical evidence on Assumption 2.[3] Yet this is a key hypothesis derived from KANAZAWA's (2004) theory of the evolution of general intelligence, which claims that general intelligence evolved to handle evolutionarily-novel entities and situations, such as the use of modern contraception. In the context of ample empirical support for Assumptions 1 and 3, the current empirical study thus provides indirect empirical support for the more effective use of modern contraception among more intelligent individuals (Assumption 2).

Methodologically, the GSS data and their measures of the key variables are far from perfect. The GSS does not directly measure the desired number of children, and I therefore have to rely on a measure of *ideal* family size. The measure of lifetime number of sex partners only measures the number of partners since 18. To the extent that contemporary Americans become sexual active before 18, the measure does not truly capture the *lifetime* number of sex partners. Most importantly, my measure of general intelligence only directly measures verbal intelligence, which is highly correlated with, but not exactly the same as, general intelligence.

Partly due to these limitations, I cannot rule out some alternative explanations of my empirical findings. For example, one anonymous reviewer suggests that more intelligent individuals can better foresee all the costs and problems associated with childrearing than less intelligent individuals, and can thus consciously choose to limit their fertility voluntarily. In other words, more intelligent individuals can make better, more informed decisions in general than less intelligent individuals. In this view, the effective use of modern contraception is only a small part of the larger decision-making process, and provides only the means to the goal of voluntary fertility control.

However, this explanation cannot account for the fact that there are no class differences in the desired (or ideal) number of children, nor the fact that the correlation between desired and actual number of children increases with intelligence. More importantly, KANAZAWA (2004, Forthcoming-a) demonstrates that more intelligent individuals do *not* make better choices in evolutionarily-familiar domains (such as marriage, parenthood, family and friendships, and wayfinding) when they do *not* involve evolutionarily-novel stimuli (such as modern means of contraception). Consistent with the theory, general intelligence appears to be an advantage *only* in evolutionarily-novel domains of life.

Apart from providing empirical support for a possible solution to the "central theoretical problem in human sociobiology", the analyses presented here provide the first empirical test of KANAZAWA's (2004) theory for the evolution of general intelligence. It appears that general intelligence evolved as a domain-specific adaptation to solve evolutionarily-novel, nonrecurrent problems, and that is why more intelligent individuals, who occupy higher social classes in modern societies, seem better able

[3] I thank two anonymous reviewers for pointing this out to me.

to employ modern means of birth control, which are evolutionarily novel. The theory also explains, among other things, why lower-class individuals with lower general intelligence have greater difficulty avoiding evolutionarily-novel health hazards, such as alcohol, tobacco, and junk food, and, as a result, become more sick and die younger than the upper-class individuals with higher general intelligence (KANAZAWA, Forthcoming-b).

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