Intelligence 38 (2010) 636–647

Contents lists available at ScienceDirect

Intelligence

Intelligence makes people think like economists: Evidence from the General Social Survey

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ARTICLE INFO

Article history:
Received 2 March 2009
Received in revised form 21 September 2010
Accepted 22 September 2010
Available online 13 October 2010

Keywords:
Economic beliefs
Ability bias
Civic returns

ABSTRACT

Education is by far the strongest predictor of whether a non-economist will share the economic beliefs of the average economist. (Caplan, 2001) Is the effect of education as large as it seems? Or is education largely a proxy for cognitive ability? Using data from the General Social Survey (GSS), we show that the estimated effect of education sharply falls after controlling for intelligence. In fact, education is driven down to second place, and intelligence replaces it at the top of the list of variables that make people "think like economists." Thus, to a fair degree education is proxy for intelligence, though there are some areas—international economics in particular—where education still dominates. An important implication is that the political externalities of education may not be as large as they initially appear.

1. Introduction

Economists and the general public have systematically different beliefs about how the economy works (Caplan, 2002a, 2007). Non-economists are more skeptical of market mechanisms, especially where international and labor markets are concerned. They also tend to be more pessimistic about the past, present and future of the economy, i.e. they are more prone to believe that the economy is in decline, doing badly, and will become worse. Critics of the economics profession have blamed these differences on economists' self-serving bias (economists are rich and have high job security) and ideological bias (economists are conservative ideologues). However, these explanations fail empirically: large belief differences between economists and the public persist even after controlling for income, job security, political party identification, ideology, and more (Caplan, 2001, 2002a). Absent an empirically sound explanation for expert bias on the part of economists, the belief gap appears to be the result of the public's systematic bias. The importance is difficult to overstate; if the public has systematically biased beliefs about economics, sound economic policy will frequently lack popular support.

Of course, the public's beliefs about economics vary greatly—some people think more like economists than others. Using the Survey of Americans and Economists on the Economy (Washington Post, Kaiser Family Foundation & Harvard University, 1996; henceforth SAEE), Caplan (2002a) found that a variety of demographic factors are correlated with "thinking like an economist," including gender, job security, real income, and level of education. Of all these determinants, education was by far the most powerful, and remains so after controlling for other important individual characteristics. Overall, each step of education on a 1–7 scale in the SAEE has 9.3% as much effect on economic beliefs as a Ph.D. in economics (Caplan, 2001, p. 416).

Why would education appear to have such a large effect? It is easy to list causal hypotheses. Education might specifically teach students about economics (Frey, Pommerehne & Gygi, 1993; Gleason & van Scyoc, 1995; Kirchgässner, 2005; Walstad, 1992; Walstad & Rebeck, 2002) or simply impart the critical thinking skills to see through popular fallacies (Terenzini, Springer, Pascarella & Nora, 1995). Alternately, education could indirectly accomplish these things through peer effects (Hanushek, Kain, Markman & Rivkin, 2003; Hoxby, 2001; Zimmerman, 2003): If you spend time with others who have

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doi:10.1016/j.intell.2010.09.005

studied economics and/or critical thinking, perhaps some of it will spill over to you.

Before weighing these possibilities, however, it is worth testing the causality of education's effect on economic beliefs. Labor economists have long worried that their estimates on the returns to education with regard to both present income and lifetime earnings measures might suffer from "ability bias"(Altonji & Pierret, 2001; Card, 2001; Griliches, 1977; Krueger & Lindahl, 2001). If education and ability are positively correlated, and ability has a direct effect on earnings, then regressing earnings on education alone leads to an inflated estimate of its effect on earnings. Previous estimates of education's effect on economic beliefs suffer from an isomorphic problem: If education and cognitive ability are positively correlated, and ability has a direct effect on beliefs, then regressing beliefs on education alone lead to an inflated estimate of its effect on those beliefs. This is particularly worrisome because there is ample evidence that education and cognitive ability are strongly correlated (Heckman & Vytlacil, 2001). As Ceci (1991, p. 705) reports, "Correlations between the highest grade in school completed and full-scale IQ are often very large, frequently in excess of .8."

Ability bias is of special concern because intelligence is likely to impact economic beliefs in a number of ways. Primarily, higher intelligence is associated with greater learning potential and knowledge acquisition. Intelligence research has established a connection between intelligence measures and a variety of behaviors and attitudes, ranging from beliefs about science and religion to political awareness and civic participation (Deary, Batty & Gale, 2008; Deary, Lawn, Brett & Bartholomew, 2009; Nyborg, 2009; Oesterdiekhoff & Rindermann, 2007; Rindermann, 2008). It would seem likely that beliefs about economics are similarly influenced by intelligence, and worthwhile to empirically test the impact of intelligence on those beliefs.

Labor economists have a wide variety of strategies for handling ability bias when estimating education's effect on earnings (Altonji & Pierret, 2001; Card, 2001; Krueger & Lindahl, 2001). The most straightforward method, though, is to add a measure of intelligence to the set of independent variables as a control (Griliches, 1977). Papers that follow this approach find that the estimated return to education falls substantially (Blackburn & Neumark, 1993; Cawley, Heckman, Lochner & Vytlacil, 2000; Gould, 2005; Murnane, Willett & Levy, 1995; Taber, 2001). As Heckman (1995, p. 1111) explains,

> The evidence on this issue is consistent across many studies. When one controls for the Hernstein–Murray measure of ability [AQFT score, a proxy for IQ] the returns to education sometimes fall by as much as 35 percent… Ability and education are distinct, and both have economic rewards.

To the best of our knowledge, however, no previous study of economic beliefs makes any attempt to correct for ability bias. Some studies of the effect of education on economic beliefs do control for income (Caplan, 2001, 2002a), but none of them controls for intelligence. This raises the possibility that the tendency of education to increase economic literacy—and thus improve the quality of economic policy—has been overestimated.

Unfortunately, the data sets used in previous research, including the SAEE, simply do not contain a measure of intelligence. The most straightforward method of correcting previous studies for ability bias is unavailable. The main reason for this omission from the SAEE and similar surveys, apparently, is that adding an IQ test or proxy to a survey of economic beliefs would be too costly.

2. Method

2.1. Question selection

Surprisingly, then, there already exists a survey that measures a) economic beliefs, b) education and other standard predictors of economic beliefs, and c) intelligence. The data set is the General Social Survey (Davis, Smith & Mardsen, 2005; henceforth GSS). The GSS, administered every two years by the National Opinion Research Center, is the largest national public opinion survey in the United States. It includes literally thousands of questions on numerous topics, and includes a wide variety of demographic information. Relevant to our purposes, the GSS contains the variable WORDSUM, a ten-word vocabulary subtest from the Wechsler Adult Intelligence Scale (henceforth WAIS).

The GSS contains hundreds of questions with *some* relevance to economics. We begin by narrowing this list down. Caplan (2007) groups non-economists' misconceptions about economics into four main categories:

1. Anti-market bias: the tendency to underestimate the economic benefits of the market mechanism.
2. Anti-foreign bias: the tendency to underestimate the economic benefits of interaction with foreigners.
3. Make-work bias: the tendency to underestimate the economic benefits of conserving labor.
4. Pessimistic bias: the tendency to overestimate the severity of economic problems and underestimate the (recent) past, present, and future performance of the economy.

We searched the full GSS for all the questions closely linked to these four biases, and found 34 that seemed most appropriate. Table 1 lists the questions, and breaks them down by bias. The first and largest block checks for anti-market bias: what do people think about the price mechanism, regulation, and private versus government ownership? The second block checks for anti-foreign bias using questions about trade and immigration. The third block checks for make-work bias: should government try to create and protect jobs, and, if so, how? The final block checks for pessimistic bias, asking respondents what they think about the past, present, and future of the economy.

It is worth pointing out that—in contrast to the questions in the SAEE—many of the questions in GSS are normative, that is they reflect attitudes and opinions. However, in most of the cases under consideration, the gap between facts and values is narrow. (Caplan, 2002b) Controlling for other factors, we should expect people who believe that economic policy X is socially beneficial to favor economic policy X. (Citrin & Green, 1990; Sears & Funk, 1990) For example, since the well-educated tend to see international trade as good for the economy, we should also expect the well-educated to be more opposed to protectionist policies. As the next section shows, that is typically just what we see.

In order to make the GSS results comparable to Caplan's (2001, 2002a) results from the SAEE, we tried to closely match

Table 1
Questions and mean answers from the GSS.

#	Variable	Question	Mean
Anti-market bias			
Here are some things the government might do for the economy. Circle one number for each action show whether you are in favor of it or against it. 1 = "strongly in favor of"; 2 = "in favor of"; 3 = "neither in favor nor against"; 4 = "against"; 5 = "strongly against"			
1	setwage	Control of wages by legislation.	3.34
2	setprice	Control of prices by legislation.	3.08
3	lessreg	Less government regulation of business.	2.60
On the whole, do you think it should or should not be the government's responsibility to... 1 = "Definitely should be"; 2 = "Probably should be"; 3 = "Probably should not be"; 4 = Definitely should not be"			
4	pricecon	Keep prices under control.	2.10
5	aidindus	Provide industry with the help it needs to grow.	2.23
6	reqinfo	It is the responsibility of government to require businesses to provide consumers with the information they need to make informed choices. 1 = "Agree strongly"; 2 = "Agree somewhat"; 3 = "Disagree somewhat"; 4 = "Disagree strongly"	2.22
What do you think the government's role in each of these industries should be. 1 = "Own it"; 2 = "Control prices and profits but not own it"; 3 = "Neither own it nor control its prices and profits"			
7	ownpower	Electric power.	2.28
8	ownsteel	The steel industry.	2.60
9	ownbanks	Banking and insurance.	2.41
10	econsys	On the whole, do you think our economic system is... 1 = "The best system we could possibly have"; 2 = "Basically okay but in need of some tinkering?"; 3 = "In need of some fundamental changes?"; 4 = "Needing to be replaced by some other system?"	2.47
11	buspow	How about business and industry, do they have too much power or too little power? 1 = "Far too much power"; 2 = "Too much power"; 3 = "About the right amount of power"; 4 = "Too little power"; 5 = "Far too little power"	2.47
12	privent	Private enterprise is the best way to solve America's economic problems. 1 = "Strongly agree"; 2 = "Agree"; 3 = "Neither agree nor disagree"; 4 = "Disagree"; 5 = "Strongly disagree"	2.46
To what extent do you agree or disagree with the following statements? 1 = "Strongly agree"; 2 = "Agree"; 3 = "Disagree"; 4 = "Strongly disagree"			
13	profits1	The way most companies work, the only thing management cares about is profits, regardless of what workers want or need.	2.08
14	profits2	Corporations should pay more of their profits to workers and less to shareholders.	2.03
On these cards are some opinions about the government and the economy. For each one I'd like you to tell me whether you... 1 = "Strongly agree"; 2 = "Somewhat agree"; 3 = "Somewhat disagree"; 4 = "Strongly disagree"			
15	equal2	The economy can run only if businessmen make good profits. That benefits everyone in the end.	2.13
16	equal7	Generally speaking, business profits are distributed fairly in the United States.	2.83
17	bosswrks	There will always be conflict between management and workers because they are really on opposite sides 1 = "Strongly agree"; 2 = "Agree"; 3 = "Neither agree nor disagree"; 4 = "Disagree"; 5 = "Strongly disagree"	2.95
Anti-foreign bias			
What do you think will happen as a result of more immigrants coming to this country? Is each of these possible results... 1 = "Very likely"; 2 = "Somewhat likely"; 3 = "Not too likely"; 4 = "Not at all likely"			
18	immunemp	Higher unemployment	1.56
19	letin	Do you think the number of immigrants from foreign countries who are permitted to come to the United States to live should be... 1 = "Increased a lot"; 2 = "Increased a little"; 3 = "Left the same as it is now"; 4 = "Decreased a little"; 5 = "Decreased a lot"	3.74
20	imports	America should limit the import of foreign products in order to protect its national economy 1 = "Strongly agree"; 2 = "Agree"; 3 = "Neither agree nor disagree"; 4 = "Disagree"; 5 = "Strongly disagree"	2.26
21	excldimm	America should take stronger measures to exclude illegal immigrants. 1 = "Agree strongly"; 2 = "Agree somewhat"; 3 = "Neither agree nor disagree"; 4 = "Disagree somewhat"; 5 = "Disagree strongly"	1.87
There are different opinions about immigrants from other countries living in America. (By "immigrants" we mean people who come to settle in America.) How much do you agree or disagree with each of the following statements? 1 = "Agree strongly"; 2 = "Agree somewhat"; 3 = "Neither agree nor disagree"; 4 = "Disagree somewhat"; 5 = "Disagree strongly"			
22	immameco	Immigrants are generally good for America's economy	2.98
23	nafta2alt	Generally speaking, would you say that America benefits or does not benefit from being a member of NAFTA? 1 = "Benefits"; 2 = "Don't know"; 3 = "Does not benefit"	1.91

Table 1 (*continued*)

#	Variable	Question	Mean
Make-work bias			
Here are some things the government might do for the economy. Circle one number for each action to show whether you are in favor of it or against it. 1 = "strongly in favor of"; 2 = "in favor of"; 3 = "neither in favor nor against"; 4 = "against"; 5 = "strongly against"			
24	makejobs	Government financing of projects to create new jobs.	2.16
25	cuthours	Reducing the work week to create more jobs.	3.21
26	savejobs	Supporting declining industries to protect jobs.	2.62
On the whole, do you think it should or should not be the government's responsibility to... 1 = "Definitely should be"; 2 = "Probably should be"; 3 = "Probably should not be"; 4 = Definitely should not be"			
27	jobsall	Provide a job for everyone who wants one.	2.70
On these cards are some opinions about the government and the economy. For each one I'd like you to tell me whether you... 1 = "Strongly agree"; 2 = "Somewhat agree"; 3 = "Somewhat disagree"; 4 = "Strongly disagree"			
28	equal3	The government must see to it that everyone has a job and that prices are stable, even if the rights of businessmen have to be restricted.	2.63
Pessimistic bias			
29	newpast	How about the economy. Would you say that over the past year the nation's economy has... 1 = "Gotten much better"; 2 = "Gotten somewhat better"; 3 = "Stayed the same"; 4 = "Gotten somewhat worse"; 5 = "Gotten much worse"	3.09
30	newfutr	What about the *next* 12 months? Do you expect the national economy to... 1 = "Get much better"; 2 = "Get somewhat better"; 3 = "Stay the same"; 4 = "Get somewhat worse"; 5 = "Get much worse"	2.87
On these cards are some opinions about the government and the economy. For each one I'd like you to tell me whether you... 1 = "Strongly agree"; 2 = "Somewhat agree"; 3 = "Somewhat disagree"; 4 = "Strongly disagree"			
31	equal6	All in all, one can live well in America.	1.71
Now I'd like your opinions on a number of different things. 1 = "Agree"; 2 = "Disagree"			
32	anomia5	In spite of what some people say, the lot (situation/condition) of the average man is getting worse, not better.	1.38
33	anomia6	It's hardly fair to bring a child into the world with the way things look for the future.	1.60
34	kidssol	When your children are at the age you are now, do you think their standard of living will be... than yours is now? 1 = "Much better"; 2 = "Somewhat better"; 3 = "About the same"; 4 = "Somewhat worse"; 5 = "Much worse"	2.36

Notes on Recoding:
nafta2alt: The GSS codes responses to nafta2 as follows: 1 = "Benefits," 2 = "Does not benefit," and 3 = "Don't know." Our nafta2alt variable recodes nafta2 so 1 = "Benefits," 2 = "Don't know," and 3 = " Does not benefit."
newpast: This variable combines the information from GSS variable econpast—which asks "Would you say that over the past year the nation's economy has gotten better, stayed about the same, or gotten worse?,"—with information from its branching follow-up questions, pastup and pastdown. Pastup asks people who said "gotten better," "Would you say much better or somewhat better?" Pastdown asks people who said "gotten worse," "Would you say much worse or somewhat worse?"
newfutr: newfutr combines the information from GSS variable econfutr with information from its branching follow-up questions futrup and futrdown.

those control variables. This proved feasible. Though there are slight differences in wording, the GSS, like the SAEE, contains measures of age, gender, race, party identification, ideology, income, income growth,[1] job security, and education (Table 2). Since many of the questions in the GSS were asked in more than one year, we are also often able to add a year trend to the list of controls.

2.2. WORDSUM as an intelligence measure

What makes the GSS special, of course, it that it has a measure of intelligence. Half of all respondents, chosen at random, take a ten-word vocabulary subtest from the WAIS, a popular IQ test (Zhu & Weiss, 2005). WORDSUM is a respondent's number of correct answers.

If intelligence is thought of as the ability to think or acquire knowledge, the WORDSUM subtest is not a direct test of intelligence, but rather a test of knowledge. However, measures of vocabulary knowledge typically correlate very highly with tests of general intelligence (Alwin, 1991; Miner, 1957; Zhu & Weiss, 2005). Wechsler (1958, p.85) reports a correlation greater than .8 between overall WAIS score and the WAIS Vocabulary subtest. Miner (1961) concluded that the correlation between 20-word vocabulary tests and general intelligence was at least .75. While many find the strength of the link between vocabulary and intelligence surprising, Wechsler argues that there is a logical explanation:

> Contrary to lay opinion, the size of a man's vocabulary is not only an index of his schooling, but also an excellent measure of his general intelligence. Its excellence as a test of intelligence may stem from the fact that the number of words a man knows is at once a measure of his learning ability, his fund of verbal information and the general range of his ideas. (1958, p. 84)

[1] The SAEE measures both recent and expected income growth; the GSS measures only recent income growth.

Table 2
Control variables.

Variable	Question/coding	Mean
Age	(year of survey - birth year)	45.21
Male	1 = male; 0 = female	.44
What race do you consider yourself?		
Black	= 1 if black, 0 otherwise	.14
othrace	= 1 if other race, 0 otherwise	.03
Generally speaking, do you usually think of yourself as a Republican, Democrat, Independent, or what?		
othparty	= 1 if other party/refused to say	.01
Partyid * (1 − othparty)	0 = strong democrat; 1 = not very strong Democrat; 2 = independent, close to Democrat; 3 = independent; 4 = independent, close to Republican; 5 = not very strong Republican; 6 = strong Republican	2.65
We hear a lot of talk these days about liberals and conservatives. I'm going to show you a seven-point scale on which the political views that people might hold are arranged from extremely liberal—point 1—to extremely conservative—point 7. Where would you place yourself on this scale?		
Ideology	1 = "extremely liberal" 2 = "liberal" 3 = "slightly liberal" 4 = "moderate" 5 = "slightly conservative" 6 = "conservative" 7 = "extremely conservative"	4.10
Log(real income)	Family income in logged 1986 dollars	9.94
During the last few years, has your financial situation been getting better, worse, or has it stayed the same?		
Income growth	1 = "getting worse" 2 = "stayed the same" 3 = "getting better"	2.18
Thinking about the next 12 months, how likely do you think it is that you will lose your job or be laid off—very likely, fairly likely, not too likely, or not at all likely?		
Job security	1 = "very likely" 2 = "fairly likely" 3 = "not too likely" 4 = "not at all likely"	3.49
Education	Years of schooling completed	12.54
Year	Year in which question was asked	1987.41
Intelligence	Total number of correct words (out of ten)	5.98

Derived from GSS variable identifiers AGE, SEX, RACE, PARTYID, POLVIEWS, REALINC, FINALTER, JOBLOSE, EDUC, and WORDSUM.

Despite its brevity, WORDSUM shares the psychometric virtues of the WAIS subtest from which it is derived. As mentioned earlier, the correlation between the GSS vocabulary subtest and the Army General Classification Test (AGCT) is .71 (Wolfle, 1980, p.110). Results of demographic studies using WORDSUM and the GSS parallel those that use other measures of IQ (Huang & Hauser, 1996; Rosenbaum, 2000).

Thus, while not a direct measure of intelligence, the WORDSUM subtest is essentially a measure of crystallized intelligence, i.e. the knowledge the subtest's results show reflect not innate intelligence but the level of knowledge that respondents needed their intelligence to acquire. The development of vocabulary depends crucially on fluid intelligence and therefore can be seen as a proxy for general intelligence (Cattell, 1987/1971).

WORDSUM is not the best possible measure of intelligence. It suffers from a moderate ceiling effect, with 6% of respondents earning a perfect score. Nevertheless, WORDSUM is a brief, and therefore low-cost, proxy.

3. Results

3.1. Benchmark results

Before we can see whether IQ affects economic beliefs, we must first analyze economic beliefs *without* controlling for IQ. We accordingly ran OLS regressions with standardized betas for each of the 34 beliefs in Table 1 as a function of all of the control variables in Table 2 *except* for intelligence.[2] The results are quite consistent with Caplan (2001, 2002a). In the GSS, like the SAEE, education makes respondents substantially more likely to "think like economists"—i.e., reject anti-market, anti-foreign, make-work, and pessimistic views of the economy. Furthermore, in both data sets, being male, income growth, and job security all tend to push in the same direction as education. On closer examination, however, the cost of controlling for job security exceeds the benefit. Its effect is relatively weak, and—since only half the sample was asked about job security—we can double our sample size by removing it from the list of regressors. We therefore drop job security as a control variable for our benchmark equations and the remainder of the paper.

Table 3 provides an overview of our benchmark equations—regressions of each of the beliefs in Table 1 on age, age squared, gender, race, party identification, ideology, income, income growth, and education. Education turns out to be even more

[2] Data on job security was unavailable for four questions.

Table 3
What makes people think like economists, omitting intelligence.

#	Variable	Educ.	Male	Income growth	Income	Repub.	Conserv.
Anti-market bias							
1	setwage	√	√		√	√	√
2	setprice	√	√		√	√	√
3	lessreg	√	√			√	√
4	pricecon	√	√		√	√	√
5	aidindus	√			√	√	√
6	reqinfo		√			√	
7	ownpower		X				√
8	ownsteel	√			√		√
9	ownbanks	√					√
10	econsys	√			√	√	
11	buspow					√	√
12	privent	√	√		√	√	√
13	profits1	√				√	
14	profits2	√			√	√	√
15	equal2		√			√	√
16	equal7				√	√	√
17	bosswrks	√			√		
Anti-foreign bias							
18	immunemp	√					X
19	letin	√			X		X
20	imports	√				√	X
21	excldimm	√			X	X	X
22	immameco	√	√				
23	nafta2alt	√					X
Make-work bias							
24	makejobs	√	√		√	√	√
25	cuthours	√			√	√	√
26	savejobs	√	√			√	
27	jobsall	√	√	√	√	√	√
28	equal3	√		√	√	√	√
Pessimistic bias							
29	newpast	√	√	√	√	X	
30	newfutr		√	√		X	X
31	equal6		√		√	√	
32	anomia5	√	√	√	√	√	
33	anomia6	√		√	√	√	
34	kidssol	X		√		X	
		26 √	15 √	7 √	18 √	22 √	17 √
		1 X	1 X	0 X	2 X	4 X	6 X

√ = coefficient significant at the 5% level and reduces agreement with anti-market/anti-foreign/make-work/pessimistic views.
X = coefficient significant at the 5% level and increases agreement with anti-market/anti-foreign/make-work/pessimistic views.

important in the GSS than in the SAEE. It is significant at the 5% level and has the expected sign in 26 questions; it is significant at the 5% level and has the opposite of the expected sign only once. Male gender has the expected effect 15 times, and the opposite once. Income growth has the expected sign seven times, and never has the opposite of the expected sign.

Thus, all the variables that "make people think like economists" in the SAEE do the same in the GSS. Nevertheless, there are two notable differences between these two data sets' results.

First, in the SAEE, income *level* has almost no effect on economic beliefs after controlling for education. In the GSS, in contrast, income level often predicts economic beliefs. Furthermore, while income matters much less than education, it pushes in the same direction. On reflection, this difference is not surprising. One would expect self-interest to matter less on positive questions than normative ones; and while all the questions in the SAEE are positive, most of the questions in the GSS are normative. Consistent with this explanation, income has little effect on the GSS's subset of positive questions (Caplan & Miller, in press) (Table 4).

The second difference: In the SAEE, the effects of party and ideology are orthogonal to the effects of education; in the GSS, Republicans and conservatives are more likely to accept views typical of the well-educated. The reason for this difference is probably the choice of topics. In both the SAEE and the GSS, conservatives are less anti-market, but more anti-foreign. In the SAEE, however the number of questions about markets roughly equals the number of questions about foreigners. In the GSS, in contrast, questions about markets outnumber questions about foreigners by more than a factor of two (Miller, 2009). Adjusting for the composition of the questions, then, both data sets show similar relationships between party, ideology, and education.

3.2. Estimating the effect of education

How large is the effect of education on economic beliefs in the GSS? Table 5 shows education's coefficients and t-stats for our benchmark equations. The effects are highly statistically significant, with absolute t-stats greater than three in 22 out of 34 equations.

Table 5 also shows the magnitude of the effect of education, using standardized betas. Notice that the standardized coefficient of education is over .10 for 23 of the questions. Since this is categorical data, this implies sizable differences in the underlying belief distributions. Consider the question with the largest belief gap (item 12): "America should limit the import of foreign products in order to protect its national economy." The belief gap between respondents with the average level of education and those with an extra standard deviation is nearly a third of a point. This implies that an additional standard deviation of education nearly doubles the probability that a respondent opposes protectionism.

Finally, we want to formally test whether education is the most important overall determinant of economic beliefs in the GSS. To do so, we use Pearson's p_λ test, which provides a criterion for ranking the "overall" statistical significance of an independent variable in a set of equations (Maddala, 1977, p. 47–8). The p_λ statistic is essentially a measure of meta-significance that measures the impact of an independent variable over an entire battery of dependent variables, such as our survey questions. It is useful because factor analysis and related techniques are not possible with the array of economic questions in the GSS. The primary strength of the GSS, that it includes many questions over a long period of time, is also a shortcoming. Many topical questions were not asked in the same survey year and even within years there may not be any individual respondents who were asked numerous questions on economic beliefs. We found that an attempt to perform factor analysis would eliminate all observations for more than half of the economic questions used, and up to 60% of the observations for the survey questions remaining. Fortunately, a p_λ provides a measure of the independent variables' impact on the four overall, broader categories of economic belief. Table 6

Table 4
What makes people think like economists, including intelligence.

#	Variable	Wordsum	Educ.	Male	Income growth	Income	Repub.	Conserv.
Anti-market bias								
1	setwage	√				√	√	√
2	setprice	√	√	√		√	√	
3	lessreg			√			√	√
4	pricecon	√	√	√		√	√	√
5	aidindus	√	√				√	
6	reqinfo			√				
7	ownpower			X				
8	ownsteel	√						√
9	ownbanks			X				√
10	econsys	√		√		√	√	
11	buspow						√	√
12	privent			√		√	√	√
13	profits1	√					√	
14	profits2	√	√	√		√	√	√
15	equal2			√			√	√
16	equal7					√	√	√
17	bosswrks	√				√		√
Anti-foreign bias								
18	immunemp	√	√					
19	letin	√						
20	imports	√	√	√				X
21	excldimm							X
22	immameco		√	√				
23	nafta2alt		√					
Make-work bias								
24	makejobs		√	√		√	√	√
25	cuthours		√				√	√
26	savejobs	√	√	√		√	√	
27	jobsall	√	√	√	√	√	√	√
28	equal3	√	√	√	√	√	√	√
Pessimistic bias								
29	newpast		√	√		√	X	
30	newfutr			√	√		X	X
31	equal6			√		√	√	
32	anomia5	√	√	√	√	√	√	√
33	anomia6	√	√		√	√	√	
34	kidssol				√			
		17 √	14 √	16 √	6 √	16 √	20 √	16 √
		0 X	0 X	2 X	0 X	0 X	2 X	3 X

√ = coefficient significant at the 5% level and reduces agreement with anti-market/anti-foreign/make-work/pessimistic views.
X = coefficient significant at the 5% level and increases agreement with anti-market/anti-foreign/make-work/pessimistic views.

shows the p_λ test statistic, λ, for each independent variable in our benchmark regressions, on the null hypothesis that the true coefficient for the variable is zero in all 34 equations. As expected, education is by far the strongest predictor of economic beliefs in the GSS, just as it is in the SAEE (Caplan, 2002b). Party identification takes a distant second place.

3.3. Estimating the effect of intelligence

Our benchmark results from the GSS parallel those of earlier research. Education consistently has the expected sign, its effect is large in both statistical and economic terms, and it is the single strongest predictor of economic beliefs. Since the benchmark results control for income, it is tempting to take these estimates of education's importance at face value, but this would be premature. Even after controlling for income, all the results in the last section potentially suffer from ability bias.

To address this problem, we re-estimate all of the benchmark equations after adding WORDSUM to the set of independent variables. In addition to the regression results without WORDSUM, Table 5 shows the sign patterns for intelligence, education, gender, income growth, income, party, and ideology. Intelligence is statistically significant and has the expected sign in seventeen questions; the opposite sign is not statistically significant for any question. The effect of education correspondingly diminishes. In the benchmark specification, education's coefficient was statistically significant and had the expected sign 26 times (with one exception); this falls to 16 times (with no exceptions). The sign patterns of the remaining variables, in contrast, weaken only slightly.

Table 5 compares the impact of education and intelligence in more detail. The effect of education sharply declines after controlling for intelligence. While the effect of education is still substantial, it is noticeably smaller than the effect of intelligence.

In economic terms, similarly, the size of the effect of education is markedly smaller after controlling for intelligence. The belief gap between the average respondent and the better-educated respondent now exceeds .10 in only ten equations,

Table 5
The effect of education on economic beliefs. (Standardized coefficients for EDUC and WORDSUM).

#	Variable	EDUC (Beta)	t-stat	EDUC (Beta) with WORDSUM control	t-stat	WORDSUM (Beta)	t-stat
Anti-market bias							
1	setwage	.11	5.56	.01	.42	.17	5.43
2	setprice	.15	7.58	.07	2.41	.16	5.21
3	lessreg	−.04	−2.03	.03	.81	.00	−.19
4	pricecon	.26	13.20	.20	6.53	.16	5.39
5	aidindus	.13	6.15	.11	3.39	.07	2.11
6	reqinfo	−.03	−.84	−.04	−.95	.06	1.32
7	ownpower	.00	.15	−.03	−.65	−.01	−.24
8	ownsteel	.13	4.73	.02	.31	.12	2.21
9	ownbanks	.11	3.81	.01	.23	.07	1.37
10	econsys	−.11	−3.55	−.07	−1.59	−.11	−2.64
11	buspow	−.30	−1.42	.01	.33	−.06	−1.72
12	privent	−.06	−3.26	−.04	−1.56	−.03	−1.16
13	profits1	.10	3.19	.03	.79	.10	2.51
14	profits2	.18	6.06	.10	2.50	.14	3.60
15	equal2	.00	.02	.01	.33	−.02	−.66
16	equal7	.03	1.08	.00	.09	.05	1.59
17	bosswrks	.13	4.02	.06	1.46	.13	3.26
Anti-foreign bias							
18	immunemp	.17	5.36	.12	2.77	.11	2.54
19	letin	−.17	−7.66	−.07	−1.67	−.13	−3.09
20	imports	.31	10.07	.24	5.60	.16	3.72
21	excldimm	.08	2.67	.07	1.63	.04	.88
22	immameco	−.23	−7.02	−.19	−4.24	−.06	−1.30
23	nafta2alt	-.17	−5.20	−.15	−3.38	−.07	−1.47
Make-work bias							
24	makejobs	.12	6.10	.08	2.36	.05	1.66
25	cuthours	.08	4.10	.07	2.28	.03	.92
26	savejobs	.22	10.97	.14	4.76	.18	6.01
27	jobsall	.11	8.46	.06	2.93	.14	7.02
28	equal3	.19	6.51	.11	3.49	.15	4.69
Pessimistic bias							
29	newpast	−.12	−3.84	−.14	−3.28	.05	1.11
30	newfutr	−.05	−1.75	−.03	−.72	−.00	−.06
31	equal6	−.02	−.71	−.02	−.54	.02	.74
32	anomia5	.14	16.93	.11	8.47	.10	8.19
33	anomia6	.24	28.01	.16	12.60	.18	14.53
34	kidssol	.03	2.01	.02	.66	.04	1.80

compared to 23 without the WORDSUM control. Belief gaps between average and higher intelligence respondents exceed .10 in 14 equations.

The lesson of Table 5, then, is that the benchmark results (those that do not take intelligence into account) frequently suffer from ability bias. To take a particularly striking illustration, consider how predicted beliefs about "control of wages by legislation" (item 1) change after controlling for intelligence. Omitting a measure of intelligence, education appears to have a very large effect. A standard deviation of education makes people .11 units more opposed to wage controls. Controlling for intelligence, however, reduces the effect of a standard deviation of education to .01. The same exercise reveals that a standard deviation of intelligence makes people .17 units more opposed to wage controls.

Intelligence is more statistically and economically significant than education. But how does it score in terms of overall importance? Recall that before controlling for intelligence, education as measured by its p_λ test statistic was the most important overall determinant of economic beliefs. This is however no guarantee that intelligence will take over the number one position. If the richest man alive divides his assets between his two sons, it is arithmetically possible than neither heir will be the richest man alive.

Table 6
p_λ Test statistics for benchmark equations.

Variable	$\lambda \sim \chi^2(68)$
Age	226.95
Age^2	206.37
Male	460.56
Black	715.77
Othrace	375.56
Othparty	140.66
Partyid*(1-Othparty)	793.59
Ideology	424.92
Income Growth	630.65
log (Real Income)	459.87
Education	2109.42
Year	291.04 [a]

[a] $\sim\chi^2(28)$ because more than one year of data is only available for 14 questions.

Table 7
p_λ Test statistics, controlling for intelligence.

Variable	$\lambda \sim \chi^2(68)$
Age	144.04
Age^2	141.60
Male	295.70
Black	329.49
Othrace	194.63
Othparty	98.31
Partyid * (1 − Othparty)	485.57
Ideology	349.35
Income growth	428.91
Log (real income)	273.21
Education	521.08
Year	147.67 [a]
Wordsum	645.84

[a] **$\sim\chi^2(28)$** because more than one year of data is only available for 14 questions.

From this perspective, the findings in Table 7 are strong. As measured by its p_λ test statistic, intelligence is the *most* important overall determinant of economic beliefs, with a λ of 645.84. Analyses of economic beliefs that omit intelligence are giving education far too much credit. Nevertheless, education takes second place in Table 7, with a λ of 521.08. Education remains more important overall than party identification, the runner-up variable in Table 6.

To sum up: Adding a measure of intelligence to the list of independent variables and re-estimating confirms that ability bias is present and substantial. Adding intelligence as an independent variable does not simply shrink our estimates of the effect of education. It is more important than education in both statistical and economic terms. In fact, intelligence turns out to be the *single strongest* predictor of economic beliefs. Our benchmark specification, which deliberately parallels earlier studies of economic beliefs, omits their strongest correlate.

Table 9
The reliability-corrected effect of education and intelligence on economic beliefs.

#	Variable	Change in mean belief | +1 SD of educ.	Change in mean belief | +1 SD of intelligence
1	setwage	−.05	.34
2	setprice	.05	.31
3	lessreg	.04	−.02
4	pricecon	.18	.22
5	aidindus	.10	.08
6	reqinfo	−.08	.11
7	ownpower	−.02	−.01
8	ownsteel	−.02	.11
9	ownbanks	−.01	.08
10	econsys	−.04	−.13
11	buspow	.02	−.07
12	privent	−.04	−.04
13	profits1	.00	.14
14	profits2	.05	.15
15	equal2	.02	−.03
16	equal7	−.01	.07
17	bosswrks	.04	.23
18	immunemp	.09	.13
19	letin	−.06	−.22
20	imports	.27	.26
21	excldimm	.08	.06
22	immameco	−.23	−.07
23	nafta2alt	−.13	−.07
24	makejobs	.08	.08
25	Cuthours	.09	.05
26	Savejobs	.14	.32
27	jobsall	.03	.25
28	equal3	.09	.22
29	newpast	−.18	.08
30	newfutr	−.05	.00
31	equal6	−.02	.04
32	anomia5	.05	.08
33	anomia6	.06	.13
34	kidssol	.01	.08

3.4. Education vs. intelligence: Breakdown by bias

We picked questions from the GSS if they were closely linked to what Caplan (2007) calls anti-market bias, anti-foreign bias, make-work bias, or pessimistic bias. What happens if we partition our results by bias? Table 8 separately computes the p_λ test statistics of each independent variable for each of these four biases.

Table 8
p_λ Test statistics, by bias.

Variable	Anti-market bias	Anti-foreign bias	Make-work bias	Pessimistic bias
	$\lambda \sim \chi^2(34)$	$\lambda \sim \chi^2(12)$	$\lambda \sim \chi^2(10)$	$\lambda \sim \chi^2(12)$
Age	60.50	19.11	33.93	30.50
Age^2	58.05	17.74	23.70	42.10
Male	188.01	17.93	39.71	50.05
Black	89.61	12.96	128.33	98.60
Othrace	35.43	81.93	23.18	54.09
Othparty	34.66	7.54	22.01	34.11
Partyid * (1 − Othparty)	281.17	21.52	103.33	79.56
Ideology	189.63	40.61	79.46	39.65
Income growth	57.24	8.27	19.37	344.03
Log (real income)	125.54	12.30	46.19	89.18
Education	94.92	91.97	74.01	260.17
Year	45.57 [a]	– [b]	26.39 [c]	75.72 [d]
Wordsum	182.69	53.65	124.67	284.83

[a] $\sim\chi^2(14)$ because more than one year of data is only available for 7 questions.
[b] More than one year of data not available.
[c] $\sim\chi^2(8)$ because more than one year of data is only available for 4 questions.
[d] $\sim\chi^2(6)$ because more than one year of data is only available for 3 questions.

There are two striking results. First, even though intelligence is the most important overall predictor of economic beliefs, it is not the most important predictor of beliefs in *any* of the four categories. Party, ideology, and male gender are stronger predictors for the anti-market questions. Education and "other race" are stronger predictors for the anti-foreign questions. Black is a stronger predictor of the make-work questions. Income growth is a stronger predictor for the pessimistic questions. Intelligence is the most important overall predictor of economic beliefs because it has a strong effect in all four categories, not because it has an overwhelming effect in any particular category.

Second, intelligence is more important than education for every category *except* anti-foreign bias. For anti-market and make-work bias, intelligence is much more important than education; for pessimistic bias, intelligence has a moderate edge. Education is, however, the *most* important predictor of anti-foreign bias. This is consistent with the literature finding that education "tends to socialize students to have more tolerant, pro-outsider views of the world" (Hainmueller & Hiscox, 2006, p. 473). In contrast, the typical educational experience gives students mixed signals about anti-market, make-work, and pessimistic biases. Classes in economics and high-IQ peers restrain these biases, but classes in other social sciences and humanities, as well as student activism, arguably encourage them.

3.5. Correcting for reliability

WORDSUM is a noisy, ten-word test, with a reliability of only .74. Years of education, in contrast, generally has a reliability around .9 (Ashenfelter & Krueger, 1994). What happens if we correct our estimates of the relative effects of intelligence and education for the implied attenuation bias?[3] Winship and Korenman (1997, 1999) find that this makes a substantial difference for decompositions of the effects of education versus intelligence.

Given the low reliability of our intelligence measure relative to that of education, one should expect intelligence to become even more important after correcting for reliability. It does (Table 9). The average reliability-corrected coefficient on WORDSUM rises by more than 50%. On a 1–5 scale, the average effect of a 1 SD increase in WORDSUM goes from .110 to .168. In contrast, education's average coefficient actually shrinks by about 5%, and the average effect of a 1 SD increase in education goes from .106 to .095. Intuitively, the GSS reveals large effects of WORDSUM *despite* the fact that it is measured with a noisy, ten-word test, so its true effect is probably larger still.

4. Discussion

If biased beliefs lead voters to support inefficient policies, and education makes voters less biased, then education has what economists would call a positive externality, or "civic return" (Caplan, 2003; Dee, 2004; Milligan, Moretti & Oreopoulos, 2004). The larger the externality, i.e. the larger the extra social benefit, the larger the socially optimal subsidy for education. The finding that much of the apparent effect of education is actually attributable to intelligence suggests that the socially optimal subsidy is less than previously thought.[4]

Yet there is an important complication: Even if education had *no* direct effect on economic beliefs, it might still indirectly affect economic beliefs by increasing intelligence (Todd & Wolpin, 2003). A consensus of researchers agrees that (a) education has a short-run effect on intelligence, and (b) these short-run effects have a strong tendency to "fade out" over time (Barnett, 1995; Currie, 2001; Currie & Thomas, 1995; Karoly et al, 1998). Some scholars, most notably Dickens and Flynn (2001), argue that there is little convincing evidence that education has *any* long-run effect on IQ.[5] Experimental studies that find otherwise are not relevant because "IQ effects in these studies have all been measured fairly close in time to the experimental change." (Dickens & Flynn, 2001, p. 364). The non-experimental studies that find otherwise, in contrast, are relevant, but methodologically flawed:

> All studies that find long-lasting effects that we have identified possess a common methodology: In effect, they regress current IQ on a measure of IQ taken when people were still in school, the number of years of school completed, and other variables. A positive coefficient on education is taken as evidence of a causal effect on IQ. That does not necessarily follow, as our model makes clear... [B]y regressing adult IQ on years of schooling completed and an earlier measure of IQ, researchers may have regressed one measure of genetic potential on two other noisy measures of genetic potential... Studies with this design are simply not informative about the effect of schooling on IQ (Dickens & Flynn, 2001, p. 364).

Others do not share Dickens and Flynn's reservations, and maintain that the data show a clear long-run effect of education on IQ. Ceci (1991, p. 717) gives a range of .25–6 IQ points (.02–.4 SDs) per year of education. Winship and Korenman (1997) gives a range of 2–4 IQ points (.13–.27 SDs) per year of education, with a "best guess" of 2.7 points (.18 SDs); Winship and Korenman (1999) have a slightly highly preferred estimate. Hansen, Heckman and Mullen (2004) gives a range of 2–4 IQ points. Cascio and Lewis (2006) estimates an effect of almost 5 IQ points per year of education.

Rather than take a position on this debate, let us explore the implications of these conflicting positions. On the Dickens–Flynn view, the *direct* effect of education on economic beliefs is the *total* effect of education on economic beliefs, at least in the long-run. If this is right, then our previous calculation from

[3] To correct for reliability, we re-estimated all of our equations with OLS, using STATA's eivreg option. Effect sizes for OLS without the reliability correction almost exactly match those we derived using ordered logits.

[4] Note, however, that changing the subsidy to education is not the only relevant policy variable. Another possibility would be to reform curricula to emphasize subjects with civic returns. Perhaps, as Steven Pinker (2002, p. 235) argues, schools should try to "provide students with the cognitive skills that are most important for grasping the modern world and that are most unlike the cognitive tools they are born with," by emphasizing "economics, evolutionary biology, and probability and statistics."

[5] To be precise, they question whether raising an *individual's* education will have any effect on his IQ. Dickens and Flynn (2001) are open to the possibility that raising the *average* level of education will raise average IQ via a "social multiplier," and Flynn (2006) speculates that this was indeed the main cause of IQ gains in the United States during the first half of the twentieth century. This admittedly raises the possibility of previously unrecognized positive externalities of education, but this issue is beyond the scope of this paper.

section four stands: Controlling for IQ, the average absolute effect of a SD of education is .106 (based on the results in Table 9).

But what if education has a lasting effect on IQ? Then the total effect on beliefs of a SD of education equals its direct effect, plus the indirect effect on beliefs of a SD of education on IQ. To illustrate, suppose we use Winship and Korenman's (1997, p. 230) preferred estimate that one year of education raises IQ by .18 SDs. Then the total effect of a SD of education equals its direct effect plus the effect of .57 SDs of IQ (.18 SDs/year multiplied by 3.17 years, the SD of education in the GSS). Under this assumption, controlling for IQ slightly *increases* the net effect of education.

However, indirect effects cut both ways. While the effect of education on IQ is in dispute, the effect of IQ on education is not (Winship & Korenman, 1999). IQ is a good predictor of high school completion, as well as admission to and completion of higher education (Herrnstein & Murray, 1994, p. 148–53). To calculate the total effect of intelligence on economic beliefs, therefore, one must count its direct effect, plus its indirect effect on beliefs via educational attainment.

Suppose we use Winship and Korenman's (1999, p. 61–3) preferred estimate that a SD of IQ causes education to go up by 1.30 years (.527 SDs in their data, .41 SDs in the GSS). Ignoring indirect effects, the average absolute effect of a SD of WORDSUM is .110. Including indirect effects, the effect of a SD of WORDSUM climbs by about 35% to .148. If we doubt the ability of education to permanently raise IQ, this further cements intelligence's position as the strongest predictor of economic beliefs. But even if we accept intermediate estimates of the effect of education on IQ, the net effect of education on economic beliefs turns out to be only slightly larger than the net effect of intelligence measures on economic beliefs.

Finally, recall that correcting for reliability sharply increases estimates of the direct effect of intelligence, and slightly reduces estimates of the direct effect of education. Table 9 re-calculates effect sizes using reliability-corrected coefficients. If intelligence raises education, but not the other way around, the net effect on economic beliefs of intelligence is more than double the net effect of education. If intelligence and education are mutually determining, intelligence still has a larger estimated effect. Indeed, if causation goes solely from education to intelligence, reliability-corrected estimates still suggest that their net effect on beliefs is roughly equal.

Estimates of the civic returns of education are clearly sensitive to estimates of the magnitude of the effect of education on IQ. If we doubt that education has a long-run effect on IQ, then controlling for IQ (or a proxy) sharply reduces estimates of the effect of education on economic beliefs. In contrast, if we accept mid-range estimates of the effect of education on IQ, the total effect of education controlling for an intelligence measure is similar to the total effect of education ignoring intelligence. Even on the latter assumption, though, controlling for intelligence illuminates the *mechanism* of civic returns: If education has a relatively large effect on economic beliefs, much of the reason would be that education increases cognitive ability, which in turn changes the way that people see the economy.

Economists and non-economists systematically disagree, but economists and highly educated non-economists disagree less. In fact, previous research has found that education is the foremost variable that "makes people think like economists" (Caplan, 2001). This paper shows that a large part of the reason for this meeting of the minds is that more educated non-economists are more intelligent than other non-economists. Education remains an important independent predictor of agreement with the "economic way of thinking," particularly for international economics. But controlling for intelligence does not merely reduce the estimated effect of education; intelligence demotes education to second place, and assumes the number one position.

Our findings are consistent with two other recent papers that explore the connection between cognitive ability and the standard rational actor model. Benjamin, Brown and Shapiro (2005) and Frederick (2005) find that the behavior of more intelligent people diverges less than usual from what the typical economist would advise. We find, similarly, that the economic beliefs of more intelligent people diverge less than usual from what the typical economist would think.[6]

Is this additional evidence that economists are right and the public is wrong? Frederick (2005, pp. 40–41) suggests that this inference is worth entertaining.

> [T]he weight that should be placed on the opinions of those with higher cognitive abilities clearly depends on the type of decision in question. If one were deciding in between a fixed- and variable-interest mortgage, imitating one's brilliant neighbor seems prudent. However, if one were deciding between an apple or an orange, Einstein's preference for apples seems irrelevant.

We agree. The crucial question is where along Frederick's continuum the GSS questions fall. In our judgment, they are closer to choosing a mortgage than choosing fruit. Many of the GSS questions are normative, but they are closely connected to positive beliefs about how the economy works. People who think in terms of supply-and-demand and comparative advantage rarely retain much sympathy for price controls or protectionism. The fact that the beliefs of economists and intelligent non-economists dovetail is another reason to accept the "economists are right, the public is wrong" interpretation of lay-expert belief gaps.

Acknowledgements

We would like to thank Bill Dickens for invaluable start-up comments, Alex Tabarrok, Ilia Rainer, and Gordon Dahl and three anonymous reviewers for helpful discussion, and the Mercatus Center for financial support. Geoffrey Lea provided excellent research assistance. The standard disclaimer applies.

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[6] See also Beaulier and Caplan (2007), which argues that higher intelligence leads to more rational beliefs and behavior.

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