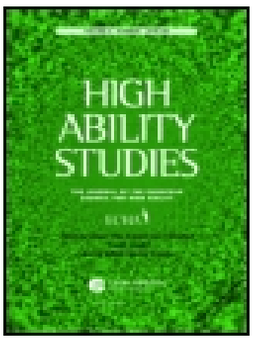

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What goes into high educational and occupational achievement? Education, brains, hard work, networks, and other factors

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What goes into high educational and occupational achievement? Education, brains, hard work, networks, and other factors

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ABSTRACT

There are many factors that go into high educational and occupational achievement, including hard work, motivation, and luck. But how important is talent? Specifically, how likely were global innovators and leaders intellectually talented or gifted when younger? This paper reviews retrospective data on multiple US samples (Total N = 11,745), including Chief Executive Officers, federal judges, politicians, multi-millionaires and billionaires, business leaders, elite journalists, and the "most globally powerful men and women", examining to what extent these groups were in the top 1% in general intellectual talent in youth, also examining their educational backgrounds. About 50% of these leaders were in the top 1% of our indicator of ability, so overrepresented by a factor of about 50. Elite education, and especially the impact of Harvard, was notable, suggesting that in addition to talent, elite education and networks were important. These data suggest that various occupations may draw from different levels of intellectual giftedness. Based on this data and a synthesis of prior literature, concrete policy recommendations for gifted education are provided. We recommend a policy focus on talented low income and disadvantaged students, who are greatly underrepresented among these leaders of US society.

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Gifted; CEO; education; *g*; networks

Introduction

What goes into high achievement or the development of educational and occupational expertise? The interplay of numerous factors (Rindermann, Ceci, & Williams, 2013), including luck (Meehl, 1978; Schroeder, 2008), the appropriate "educational dosage" (Wai, Lubinski, Benbow, & Steiger, 2010), interests and personality (Lubinski, 2004), time allocation (Makel, Wai, Putallaz, & Malone, 2015),

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and especially hard work and practice (Ericsson, Krampe, & Tesch-Romer, 1993) – what has come to be known popularly as the "10,000 hour rule" (Gladwell, 2008) – are important puzzle pieces explaining who reaches the top of any field (Simonton, 1994). However, in a synthetic review, Hambrick, Macnamara, Campitelli, Ullén, and Mosing (2016) concluded that practice cannot be the full explanation of who achieves later in life, or even the largest piece of the puzzle. In fact, in their meta-analysis across a variety of domains, Macnamara, Hambrick, and Oswald (2014) found that deliberate practice accounted for only 4% of the variance in education and less than 1% of the variance in occupations, leaving much remaining variance unaccounted for.

What factors might account for the largest sources of variance? In any prediction equation or system, it's important to account for the largest sources of variance first (Lubinski, 2004) before considering the incremental impact of other factors. In the development of educational and occupational expertise, decades of evidence points to general intelligence (*g*) as the largest source of variance to account for (Detterman, 2014; Jensen, 1998). General intelligence (individual differences in intelligence) is highly heritable (Bouchard, 2004; Neisser et al., 1996) and intelligence is highly related to the acquisition of expertise in educational and occupational domains (Kuncel, Hezlett, & Ones, 2004; Schmidt & Hunter, 2004; Wai, 2013, 2014b).

There are many perspectives on giftedness, with a general consensus in the gifted field that giftedness is a multidimensional construct (Dai, 2010; Peters, Matthews, McBee, & McCoach, 2013). However, regardless of one's verbal definition of the term "gifted," scholars have argued that *g* (which is quantitatively rather than verbally defined: the first unrotated factor in a factor analysis of individual differences in cognitive ability tests) is likely central or is a major dimension to any definition of giftedness (e.g. Thompson & Oehlert, 2010; Warne, 2016). In fact, giftedness began with *g*, in the sense that being gifted was historically synonymous with a high IQ or *g* score (Dai, 2010; Peters et al., 2013). Therefore, with full acknowledgement that giftedness can be considered a complex multidimensional construct, this paper focuses on the role of *g* and other factors that go into eventual high achievement.

Although *g* has been shown to be highly predictive of educational and occupational outcomes in the general population (e.g. Kuncel et al., 2004; Schmidt & Hunter, 1998, 2004), there have been fewer studies looking at the high end of the intelligence distribution, for example the top 1%. Given the large ability range that exists within the top 1% of the distribution alone (from IQ 135 to about IQ 200; Lubinski & Benbow, 2000), this rare right tail segment provides the opportunity to test the idea that ability matters in the development of educational and occupational expertise even at the high end. In spite of their rareness the gifted are crucial for innovation, society and politics (e.g. STEM or government effectiveness; Coyle, Rindermann, & Hancock, in press; Rindermann, Kodila-Tedika,

& Christainsen, 2015). The more developed, richer and freer a country, the more important becomes the impact of intellectual classes for the economy and society. In fact, numerous prospective longitudinal studies of individuals tested in the top 1% in ability when young and followed up when older suggest that more ability matters throughout the full right tail range (Study of Mathematically Precocious Youth: Ferriman-Robertson, Smeets, Lubinski, & Benbow, 2010; Project Talent: Wai, 2014b). These intellectually precocious youths develop into quite high achieving adults (e.g. Kell, Lubinski, & Benbow, 2013; Lubinski & Benbow, 2006; Makel, Kell, Lubinski, Putallaz, & Benbow, 2016).

So we know that smart younger people develop into high achieving adults with high likelihood. But were high achieving adults likely to be intellectually talented when younger? There are few studies looking at the high end of the intelligence distribution, but even fewer examining the high end of the occupational distribution. To address this question, this paper reviews retrospective data from numerous extreme right tail achievement occupations, essentially the people who made it to the top of the occupational and leadership hierarchy, examining to what extent these groups were in the top 1% in intelligence in their youth, and also examining their educational backgrounds. To the extent that the link between ability, education and expertise can be made using multiple sources of retrospective data would support the idea that general cognitive talent and elite education matter in the development of expertise. We can then better determine the degree to which those factors matter.

Methods

Samples

Summary data (total $N = 11{,}745$) focused on education was drawn from multiple prior publications (Wai, 2013, 2014a; Wai & Lincoln, 2016; Wai & Rindermann, 2015) and isolated to US groups: Fortune 500 Chief Executive Officers (CEOs) ($N = 500$), active federal judges ($N = 789$), Forbes billionaires ($N = 424$), senators ($N = 100$), House members ($N = 441$), Forbes most powerful men ($N = 27$), Forbes most powerful women ($N = 59$), World Economic Forum attendees ($N = 661$), Wealth-X 30 millionaires ($N = 8{,}649$), and The New Republic masthead ($N = 95$). All data collection was done through Internet searches by the first author with the exception of the data collected by Wealth-X.

Fortune 500 CEOs

Data on the 500 US ($M = 481$, $F = 17$, Wai, 2013; Age range = 39–94, Average ≈ 57) CEOs of Fortune 500 Companies in 2012 were taken from *CNN Money's* annual database of rankings (Fortune 500 CEOs; http://money.cnn.com/magazines/fortune/fortune500/2012/ceos/).

Federal judges

Data on the 789 US Active Federal Judges (M = 553, F = 236, Wai, 2013; Age range = 40–89, Average ≈ 60) were taken from the Biographical Directory of Federal Judges in January 2013 (http://www.fjc.gov/history/home.nsf/page/judges.html).

Forbes billionaires

Data on the 424 US billionaires (M = 376, F = 48, Wai, 2013; Age range = 28–97, Average ≈ 66) in 2012 were taken from *Forbes* magazine's database (The World's Billionaires; http://www.forbes.com/billionaires).

Senators

Data on the 100 US Senators (M = 80, F = 20, Wai, 2013; Age range = 39–88, Average ≈ 61) in 2012 were taken from the Biographical Directory of the United States Congress (http://bioguide.congress.gov/biosearch/biosearch.asp).

House of representatives

Data on the 441 US House members (M = 360, F = 81, Wai, 2013; Age range = 29–89, Average ≈ 56) in 2012 were also taken from the Biographical Directory of the United States Congress.

Forbes most powerful men

Data on the most powerful US men (N = 27, Wai, 2014a; For world sample: Age range = 29–88, Average ≈ 61) were drawn from the 2012 World's Most Powerful People list (http://www.forbes.com/powerful-people). The most powerful men list was created by removing women from the most powerful people list. The most powerful people list methodology included four factors: the number of people the person employed or managed, the amount of financial resources they controlled, their number of spheres of influence, and how actively they used their power (see Ewalt, 2012 for more detail). The list included billionaires, heads of state, CEOs, financiers, philanthropists, and entrepreneurs.

Forbes most powerful women

Data on the most powerful US women (N = 59, Wai, 2014a; For world sample: Age range = 27–87, Average ≈ 55) were drawn from the 2013 World's Most Powerful Women list (http://www.forbes.com/power-women/). The most powerful women list methodology included similar assessments in the areas of money, media presence, and impact (see Howard, 2013 for more detail). The list included billionaires, heads of state, CEOs, entertainment and fashion moguls, media executives, nonprofit heads, politicians, and those in technology.

World economic forum (Davos) participants

Data on the 661 US people (M = 524, F = 137, Wai, 2014a; average age for world sample was $F \approx 49$, $M \approx 52$, average ≈ 51.5, Arnett & Chalabi, 2014) who attended Davos in 2014 were taken from a list compiled by *The Wall Street Journal* (2014). The people invited to attend Davos are "business, political, academic and other leaders of society" (World Economic Forum, 2014) who are considered some of the "world's most powerful people" (The Guardian, 2014).

The New Republic

Data were included on the 95 US members of the masthead of *The New Republic* (N = 95; see Schonfeld, 2014 for link to data).

Wealth-X 30 millionaires

This sample was drawn from the Wealth-X database (Wai & Lincoln, 2016), which included individuals who were from the US and had a net worth of USD $30 million or higher and systematic education (undergraduate and/or graduate school) and baseline demographic data. This resulted in a sample of 8,649 people (Male = 7,885, Female = 749, Unknown = 15; Average age = 62.45 years). Wealth-X reviews hundreds of wealth identifiers from over 1,100 intelligence sources which include both paid and open source, as well as online and in print. An assessment of all asset holdings including privately and publicly held business and investible assets which include real estate, aircraft, yachts, artwork, and collectibles are combined to assess an individual's net worth.

Method

Gaining admission to a highly selective American college or university typically requires scoring at or above a certain level on the Scholastic Assessment Test (SAT) or the American College Test (ACT), which are standardized tests that have been shown to measure general intelligence or IQ to a large degree (Frey & Detterman, 2004; Koenig, Frey & Detterman, 2008). Murray (2012, p. 366) concluded that "the average graduate of an elite college is at the 99th [per]centile of IQ of the entire population of seventeen-year-olds," basing this conclusion on SAT test data from the College Board website. He calculated that a median combined Critical Reading and Mathematics score of 1400 or greater puts a student in the top three percent of the select population of SAT test takers and well within the top one percent of seventeen-year-olds in the general population[1]. Murray defined an elite college to be roughly one of the top dozen schools in the *U.S. News & World Report* rankings. Therefore, in addition to a marker of high education level, elite college attendance also indicates a high general ability level.

Attendance at a national university or liberal arts college that had median combined SAT Critical Reading and Math scores of 1400 or greater according to the 2013 *U.S. News* rankings (America's Best Colleges's, 2013) was used as one

reasonable indicator that the individual was in the top one percent in ability in the American population (Murray, 2012). The *U.S. News* rankings reports the 25th and 75th combined SAT Critical Reading and Math or ACT composite percentiles so an average of these two values was computed to approximate the median score. Before doing this, ACT composites were translated to SAT composites using a concordance table (ACT, 2011). There were 21 national universities and 8 liberal arts colleges that met these criteria for a total of 29 schools. Table 1(a) gives a list of these schools ranked by SAT scores.

Elite graduate school attendance was also used as a reasonable indicator that the individual was in the top one percent in ability. *U.S. News* ranks law and business schools and reports average Law School Admission Test (LSAT) and Graduate Management Admission Test (GMAT) scores which are relevant to at least two of the samples examined in this study: federal judges and Fortune 500 CEOs. The top law and business schools were rank ordered according to test scores and the top 12 from each group were selected which approximate the top 10% of test takers within each pool (GMAT, 2013; LSAC, 2007). Given that the fraction of the college graduate population who go on to take the GMAT and LSAT are extremely select, individuals who attended one of these schools are likely well within the top one percent in ability. Table 1(b) and (c) gives a list of the top 12 schools in each group ranked by LSAT and GMAT scores. Finally, because *U.S. News* only ranks other graduate schools according to narrow discipline, the list of the 21 national undergraduate universities was also used as a reasonable indicator that if an individual had attended one of these schools for graduate school other than law or business that this individual was likely in the top one percent in ability[2]. The impact of Harvard University alone was also examined to gage the impact of arguably the most prestigious US university. However, we should note that the selection criteria of students is not entirely clear, admissions may be based on more "holistic" or non-ability criteria, and that Harvard effects are likely also network and reputation effects, perhaps to a larger degree than other elite institutions.

However, just because an individual did not attend one of these schools does not mean they were not in the top one percent of ability and ultimately this method cannot disentangle the potential impact of school, family background, or other factors from the potential impact of *g*. Some students attend an elite school with lower than typical test scores (e.g. due to athletics, legacy status, political connections, affirmative action; Espenshade & Radford, 2009; Golden, 2006; Sander, 2004), whereas others who have higher than typical test scores may not have attended an elite school (e.g. financial limitations, scholarship, staying close to home). Gender roles are additionally important. This lowers the reliability of the educational measure as an ability indicator, especially at the individual level. Factors in both directions likely counterbalance one another, which makes the method reasonable for group estimates.

Table 1. Schools attended that indicate top one percent in ability status (ranked by ability).

(a) National Universities and Liberal Arts Colleges	Combined SAT math and critical reading scores
1. California Institute of Technology	1525
2. Harvey Mudd College	1500
2. Princeton University	1500
4. Yale University	1495
5. Harvard University	1490
5. Massachusetts Institute of Technology	1490
7. University of Chicago	1485
8. Columbia University	1475
9. Washington University in St. Louis	1465
9. University of Notre Dame	1465
11. Pomona College	1460
12. Stanford University	1455
12. Dartmouth College	1455
14. Northwestern University	1445
14. Vanderbilt University	1445
16. Duke University	1440
16. University of Pennsylvania	1440
16. Swarthmore College	1440
19. Brown University	1430
19. Rice University	1430
19. Tufts University	1430
22. Amherst College	1425
23. Williams College	1420
24. Carleton College	1415
25. Johns Hopkins University	1410
25. Carnegie Mellon University	1410
25. Bowdoin College	1410
28. Cornell University	1400
28. Haverford College	1400
(b) Law Schools	Average LSAT Scores
1. Yale University	173.5
1. Harvard University	173.5
3. Columbia University	172.5
4. New York University	172
5. University of Chicago	170
6. Stanford University	169.5
7. Duke University	169
7. Georgetown University	169
9. University of Pennsylvania	168.5
9. University of Michigan - Ann Arbor	168.5
11. University of Virginia	168
11. Northwestern University	168
(c) Business Schools	Average GMAT Scores
1. Stanford University	730
2. Harvard University	724
3. University of Chicago	719
3. Yale University	719
3. New York University (Stern)	719
6. University of Pennsylvania (Wharton)	718
6. Dartmouth College (Tuck)	718
8. Columbia University	716
9. University of California Berkeley	715
10. Northwestern University	712
11. Massachusetts Institute of Technology	710
12. University of Michigan – Ann Arbor (Ross)	703

Note: These data were taken from the 2013 *U.S. News* rankings (America's Best Colleges's, 2013). A combined SAT Critical Reading and Mathematics score of 1400 or greater places an individual in the top three percent of all test takers and well within the top one percent in ability of all seventeen-year-olds in the population. An LSAT score of 168 or higher and a GMAT score of 700 or higher places an individual in roughly the top 10 percent of test takers in the respective pools. Given that the fraction of the college graduate population who go on to take the GMAT and LSAT are extremely select, individuals who attended one of these schools are likely well within the top one percent in ability. Adapted from Wai (2013).

Results

Figure 1 presents the percentage of each group who – according to high school standardized test scores – were in the top 1% of general ability. "Harvard" indicates the percentage that attended Harvard (likely well above the top 1% of ability). "Elite School" indicates the percentage that attended one of the schools with average test scores that placed them in the top 1% of ability. "Graduate School" indicates the percentage that attended graduate school independent of the Elite School category and represents a group likely in the top percentiles of ability. "College" indicates the percentage that attended college but not Graduate School

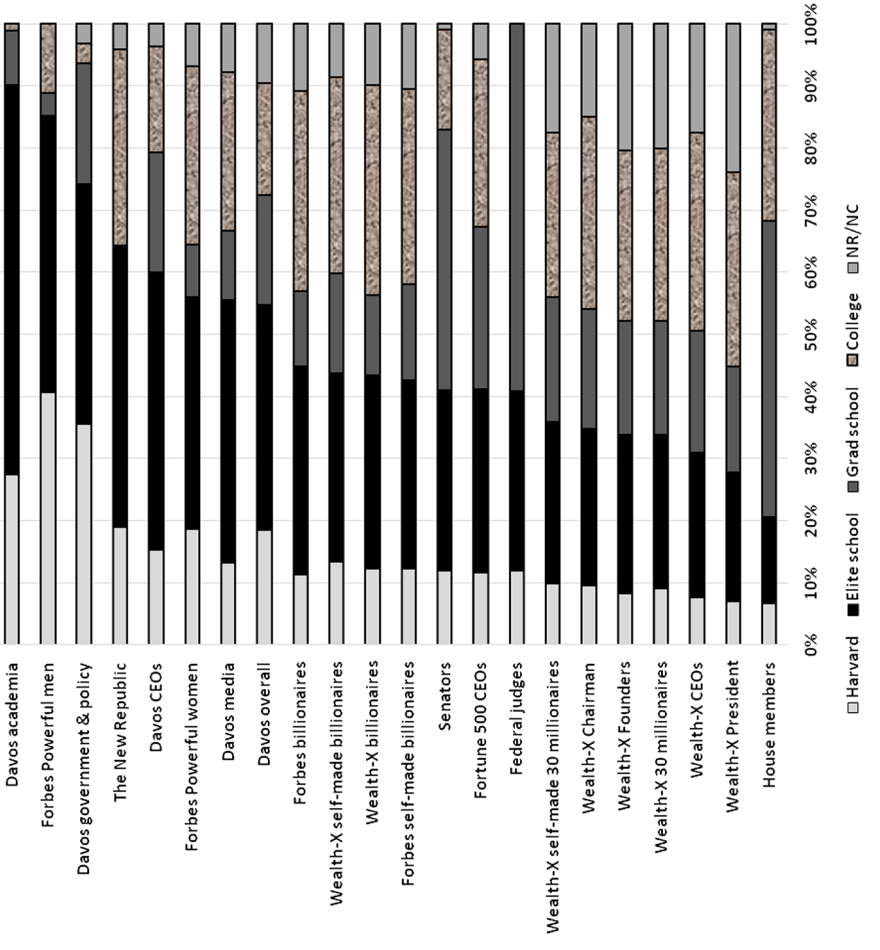

Figure 1. Cognitive ability and educational backgrounds of US elite occupational groups.
Note: Figure 1 presents the percentage of each group who – according to high school standardized test scores – were in the top 1% of general ability. "Harvard" indicates the percentage that attended Harvard (likely well above the top 1% of ability). "Elite School" indicates the percentage that attended one of the schools with average test scores that placed them in the top 1% of ability. "Graduate School" indicates the percentage that attended graduate school independent of the Elite School category and represents a group likely in the top percentiles of ability. "College" indicates the percentage that attended college but not Graduate School or an Elite School. "NR/NC" indicates the percentage that did not report (NR) any education or had no college (NC). These four categories are independent of one another and sum to 100%.

or an Elite School. "NR/NC" indicates the percentage that did not report (NR) any education or had no college (NC). These four categories are independent of one another and sum to 100%.

Figure 1 shows that roughly half of the people in these positions of leadership and power were in the top 1% in our ability indicator (summing Harvard with Elite School). Harvard percentages ranged from 6.6% for House members up through 40.7% of Forbes powerful men. Elite school percentages ranged from 20.6% for House members up through 90.1% for Davos academia. On average, 91.1% of people in these groups attended college or higher. This ranged from 76.2% for 30-millionaires who were company Presidents ("Wealth-X President" in Figure 1) up through 100% for Davos academia, federal judges, and Forbes powerful men.

Among these groups, House members were at the bottom on brainpower and education, followed by 30-millionaire CEOs ("Wealth-X CEOs"), 30-millionaires overall, federal judges, Fortune 500 CEOs, senators, billionaires overall, Davos attendees overall, Davos media, Forbes powerful women, Davos CEOs, The New Republic, Forbes powerful men, and Davos academia at the top. Generally, less selective politicians, wealthy people, judges, and CEOs were in the bottom half, billionaires were in the middle, and people invited to Davos, selective journalists, selective government officials, powerful people (including heads of countries) and selective academics composed the top half of the elite occupational distribution.

Discussion

Limitations

This research synthesis used average standardized test scores of a college or university according to *U.S. News & World Report* (America's Best Colleges's, 2013) as an approximation or "proxy" for general intelligence level (Frey & Detterman, 2004; Koenig et al., 2008). Although this method did not rely on individual test scores which were not publicly available, average test scores from US schools reasonably placed groups of individuals that attended one of these elite schools within the top 1% of ability. Ultimately, the method cannot disentangle education from cognitive ability. However, using this method may give an underestimate because extremely smart people may not have chosen to attend a top school for multiple reasons (e.g. financial limitations, scholarship, staying close to home). Alternatively, this method may also give an overestimate because there were likely some legacies, athletic or affirmative action admits, students with political connections, or others who gained entry with lower than typical test score and academic metrics (Espenshade & Radford, 2009; Golden, 2006; Sander, 2004). It is reasonable to think factors in both directions likely counterbalance one another, however lower the reliability of the method.

The people in this study are also not fully representative of the many other individuals in the top percentiles of ability worldwide, and are likely defined by attributes not limited to ability (such as high motivation, willingness to work and

engage in deliberate practice, take risks, and a desire for power, wealth, and status). Not being someone in one of these elite occupations also does not imply low cognitive ability. There are other careers for gifted people and too many other factors including chance, institutional effects and sex roles that can influence biography.

Finally, we focused on individual differences and their development across time. Additional studies analyzing individual development (e.g. qualitative or quantitative case studies) can give further insights on developmental processes and the relevance of cognitive vs. institutional and situative factors for achieving success in different domains.

Many factors are critical for high achievement, but how much talent do you need to begin with?

When combining these retrospective findings with prior prospective findings (e.g. Ferriman-Robertson et al., 2010; Wai, 2014b), it is clear that to reach the pinnacle of any educational or occupational domain, general ability or talent matters. Roughly 50% of the people who make it into the ranks of extreme right tail US achievement are in the top 1% of our indicator of *g* (overrepresented by a factor of 50), and this ranged from about 20 (House members) to 90 times (Davos academics) the base rate in the general population. A disproportionate percentage of the groups of people who reached the US occupational pinnacle were highly able when younger. And talent doesn't just matter up to a point which would indicate an ability threshold (Gladwell, 2008), but throughout the full right tail range (Park, Lubinski, & Benbow, 2007; Wai, 2013, 2014a, 2014b; Wai & Lincoln, 2016; Wai & Rindermann, 2015). Cognitive ability, or *g* in this article, is critical to high achievement. This means when considering the many other important factors that go into high achievement, one first must consider the large role of general intelligence. Given the small role found for deliberate practice for education and occupations (i.e. Macnamara et al., 2014), this also suggests talent and other factors may have a larger role to play.

The retrospective data in Figure 1 also provide case controls for extremely talented US students (i.e. the top .01%; Kell et al., 2013; Makel et al., 2016) who have now reached occupational outcomes nearly at the level as the people in Figure 1. Given that each of these elite occupation groups showed an average ability level well below the top .01% (for example, 50% of the entire sample was in the top 1% in cognitive ability), this shows that to become one of the US elite more than *g* matters, which is where many other factors become important. However, the data on extremely talented US students (Kell et al., 2013; Makel et al., 2016) clearly shows that even though it's not just the scary smart who rise to the top, they definitely do rise to the top with greater likelihood.

Does it matter where you go to college to become a leader or part of the "creative class"? The role of elite education and networks

A very large proportion of people who currently hold positions of innovation and leadership attended highly selective colleges and graduate schools and were academically talented when younger. They had high general intelligence, but they also frequently attended highly selective colleges and universities. Many of the gifted make up what Florida (2014) has called the "creative class." Contrary to media stories glamorizing college dropouts like Bill Gates and Mark Zuckerberg (e.g. Lin, 2010; Williams, 2012), nearly all gifted kids who end up as leaders went to college, often attending elite colleges and graduate institutions. The influence of Harvard in minting people who end up in positions of leadership and influence is particularly striking. This highlights the potentially large influence of admissions offices and various methods used in elite college admissions in determining the composition of who becomes a part of the US elite.

Whether done purposefully or not, the admissions filter for an elite school selects for people high on cognitive ability, motivation, and other traits, but it also provides access to networks. There are strong *institutional path effects*: Being selected by a prestigious "glamour" institution has a career enhancing effect regardless of individual ability. If people get entrance independent of ability (e.g. due to legacy, networks, sports or affirmative action), they nevertheless receive the benefit. For example, Harvard may not necessarily offer better education but better connections and prestige among other things.

One unexplored facet of educational access is the increasing competition among the most academically gifted students for elite school admission due in part to the fact that tests like the SAT and ACT actually measure *g* to a large degree (Frey & Detterman, 2004; Koenig et al., 2008). Research has shown that cognitive ability measured well before college predicts performance well after college (Park et al., 2007; Wai, 2014b), thus it remains unclear precisely how much an elite school education matters to later achievement. Dale and Krueger (2002) found that attending an elite school vs. a comparable alternative did not predict greater long-term earnings even when controlling for many factors. However, the findings on extreme right tail achievement across a variety of elite occupations seen in Figure 1 in this paper indicates that attending an elite school (and especially Harvard) may have a payoff of some kind in making it into the ranks of leadership. For example, the percentage of people who are in the right tail of wealth and other elite occupations who attended an elite school were well above base rate expectations (Guo, 2015; Thompson, 2015). Other research focused on elite scientific prize winners also shows that for whatever reason, elite schools have disproportionately produced the highest achievers throughout history (e.g. Clynes, 2016; Hsu & Wai, 2015).

How gifted do you need to be to enter various occupations? How stable are these trends across time?

Figure 1 also illustrates the wide variability in the average giftedness level of the people that compose various extreme right tail occupations. Gottfredson (2003, Fig. 15.1, p. 299) showed the wide range of cognitive ability across a variety of general population occupations, ranging from a packer (21st percentile) and material handler (25th percentile) up through research analyst and attorney (91st percentile) and discussed how more socially desirable and correspondingly prestigious occupations recruit their workers from the upper end of the general intelligence distribution (Canter, 1956). Figure 1 shows the wide variability in general intelligence loading of various occupations even in the extreme right tail, showing that giftedness is likely selected for to different degrees not only within the general population, but within the full right tail range of possible occupations (Wai & Rindermann, 2015). Wai and Rindermann (2015) also conducted the first study using this paper's method to examine whether selection on giftedness or *g* has varied across time. Within a sample of Fortune 500 CEOs over the past two decades, the *g*-loading or giftedness level of CEOs has remained the same across time. The occupational filtering structure, at least for CEOs and perhaps more broadly for business, does not appear to have changed in the last two decades, and neither has the prediction of general intelligence on later educational and occupational outcomes (Kuncel et al., 2004; Schmidt & Hunter, 1998, 2004; Wai, 2014b).

Remembering that gifted begins with g: Concrete policy recommendations for gifted education

Comparing past US generations has shown that the ability rise (the so called "Flynn" or "FLynn effect") may be petering out. Especially among the gifted strata drawn from population level data the rise has been relatively low leading to a skeptical outlook for the development of top ability individuals in the US (source NAEP, 1971–2008/2012; Rindermann & Thompson, 2013; Rindermann & Pichelmann, 2015): While the increase in the last decades for the average ability level was per decade 1.17 IQ and for the 10th percentile *dec* = 1.79, it was for the 90th percentile *dec* = 1.03 and among the particularly important 17-year-old high achiever group there was only a negligible improvement ($dec_{17y90\%}$ = .08, in 37 years .30 IQ). However, data looking at large non population level samples of US gifted individuals in the 95th percentile (e.g. Wai, Putallaz, & Makel, 2012) has shown a fairly consistent rise mainly on the math subtests, so it is unclear whether the Flynn effect in the US has ended or will continue in the future. These data provide hints for asking broader questions that impact talented kids, society, and gifted education.

Should we encourage gifted kids to attend elite schools? Some parents appear concerned with getting their children into elite schools which may not be entirely

unfounded if the goal is have your child either join or have an increased likelihood of attaining a position of leadership and innovation. However, access to elite schools within the US appears to be dominated by students from financially secure backgrounds (Bastedo & Jaquette, 2011). When doing Internet searches on these people and after reading numerous biographies in detail, it did not appear that many of the people in Figure 1 came from extremely poor backgrounds. This raises the issue of social mobility, which as Clark (2014, p. 279) puts it:

> Most parents, particularly upper class parents, attach enormous importance to the social and economic success of their children. They spare no expenditure of time or money in the pursuit of these goals. In these efforts, they seek only to secure the best for their children, not to harm the chances of others. But the social world only has so many positions of status, influence, and wealth.

There is a great deal of attention paid to gifted education after K-12, it is just called "elite education" rather than "gifted education." And much societal focus is on elite college admissions and who gets those slots. The data reviewed here show that getting one of those elite college slots can impact the likelihood of rising to the top.

What are the implications when such a large proportion of leaders and innovators have such talent? There is a clustering of brains, wealth and power in society, at least today. This means that how these largely gifted influential people choose to spend their money, time, or influence, whether to improve our world (Bill Gates; Gates, 2013), connect the world to the Internet (Mark Zuckerberg; Zuckerberg, 2014), find cost effective ways to explore space (Jeff Bezos's company Blue Origin; Stone, 2013), find a way to create a Mars colony (Elon Musk's company SpaceX; Knapp, 2012), promote their political and policy views (Page, Bartels, & Seawright, 2013; Vogel, 2014; West, 2014) and/or run for president (e.g. Donald Trump; Bump, 2015), reinvent the media (e.g. billionaire Jeff Bezos bought *The Washington Post* and billionaire Chris Hughes bought *The New Republic*; Stone, 2013), privatize science (Broad, 2014), or any other way they might choose, will be dictated largely by their personal tastes and essentially who they are and the people who influence them. We don't typically elect these elites (Hacker, 1961), but they certainly can influence who gets elected. This should make us think deeply about what that means when so few control so much of the world's wealth and power (Fottrell, 2015).

Given that people like Zuckerberg, Gates, Musk, Bezos, and many others are in the news daily, this may be partly why in the US at least people are not as willing to support gifted education. They know all these influential leaders are brilliant and they may therefore assume gifted people have a head start and don't need further assistance. Although it is true that having a higher ability level (regardless of background) provides numerous head starts in life based on the network of positive correlates surrounding *g* (Jensen, 1998), talented kids from low-income or disadvantaged backgrounds are most likely to underachieve (Siegle, 2012) and have largely become forgotten in policy discussions (Finn & Wright, 2015; Plucker,

Giancola, Healey, Arndt, & Wang, 2015; Wai & Worrell, 2016). This is why gifted education from K-12 matters immensely. To the extent that selection procedures, gifted educators, and others can encourage students from low income and disadvantaged backgrounds to attend elite schools, this might be one way to inject demographic and intellectual diversity into the ranks of leaders. It might also promote what Dai (2015, p. 269) calls a "Jeffersonian meritocracy in education," or in the words of Thomas Jefferson: "We hope to avail the state of those talents which nature has sown as liberally among the poor as the rich, but which perish without use, if not sought for and cultivated."

In a recent education policy paper, Wai and Worrell (2016) provide concrete recommendations to better level the playing field for talented but disadvantaged youth. Although the authors acknowledge that all students deserve to develop their talents, they recommend a focus on the financially disadvantaged (neglected due to very little public gifted education funding) and spatially talented (neglected due to standardized tests not including spatial measures and school systems focusing on verbal and math skills). Because in the general population spatial ability is less correlated with socioeconomic status than math and verbal ability, this means by selecting on spatial talent, more students from low income and disadvantaged backgrounds will be identified. Then, by providing the appropriate educational opportunities which we know already work for gifted students (Assouline, Colangelo, VanTassel-Baska, & Lupkowski-Shoplik, 2015; Wai et al., 2010), not only would this fulfill the talent and well-being of these students, it would also likely increase demographic and intellectual diversity among US leaders. Of the $49.8 billion 2015 federal education budget, advanced learners were barely funded, at a ratio of 500,000 to their single dollar. Even a concerted small early investment in these two gifted populations would payoff in intellectual and technological innovations and GDP and greatly level the playing field (Wai & Worrell, 2016), especially in the context of the larger national and global conversations about diversity in leadership and about educational, occupational, and wealth inequality.

Notes

1. According to Murray (2012, p. 366):

   > In 2010, a combined score of 1400 put a student at about the 97th percentile of all students who took the SAT (based on the distribution produced by the known means and standard deviations for the two tests and a correlation of + .7 between them). But the number of test-takers in 2010 represented only 36% of the seventeen-year-olds in the country. Any plausible assumptions about the proportion of the 62% of seventeen-year-olds who didn't take the SAT who could have gotten a combined score of 1400 or more puts a student who actually does score 1400 well into the 99th [per]centile of the seventeen-year-old population.

2. Because some participants attended college in a different country, there were three other schools that were classified as being part of the Elite School group due to their known selectivity and international reputations: The Indian Institutes of Technology,

Cambridge University, and Oxford University. The 2013 best college and university rankings are for present day and did not hold precise rank order across the past decades when many of the individuals in this study attended college or graduate school. However, according to Cole (2009, pp. 33, 34): "Whatever the basis for the rankings, the same small group of elite public and private universities would be designated as 'distinguished.' The top 10 or 15 in 1903 are still rated among the top 20 or so in most studies of university quality." Thus there has been relatively little shift in rank order over time among the very top schools. Due to the wide age range of individuals within each group, analyses were conducted examining the effect of age on Elite School attendance by comparing participants at or above the median age to those below the median age. For all groups a slightly higher proportion of younger participants attended an Elite School but none of these comparisons were significant. Therefore, even though participants attended Elite Schools across a wide span of time, average SAT and ACT scores are likely similar across time due to the consistent pattern of university rankings. For all these reasons, using the 2013 rankings appears reasonable.

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