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Ability rise in NAEP and narrowing ethnic gaps?

Heiner Rindermann [a,*], James Thompson [b]

[a] Department of Psychology, Chemnitz University of Technology, Wilhelm-Raabe-Str. 43, D-09107 Chemnitz, Germany
[b] Department of Psychology, University College London, Charles Bell House, 67-73 Riding House Street, London W1W 7EJ, UK

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ABSTRACT

US National Assessment of Educational Progress (NAEP) results from 1971 to 2008 enable four different effects to be distinguished: Cohort rise effects, gap-narrowing between ethnic groups, trends due to demographic changes in by NAEP listed or not listed ethnic groups. NAEP means and percentiles in reading and mathematics were transformed to conventional IQs and *SDs*. The *total increase* from 1971 to 2008 was in the scale of 4.34 IQ points (*dec* = 1.17 IQ per decade). The ability distribution became more homogenous (down from *SD* = 15.00 in 1971 to *SD* = 13.56 in 2008). Increases were larger for *younger* students (9-year olds: 2.02 IQ per decade; 13-year olds: 1.20; 17-year olds: 0.30); larger at the *lower* ability level (10th percentile *dec* = 1.79 vs. 90th percentile *dec* = 1.03). The largest increase was for Blacks (Whites *dec* = 1.29 IQ, Hispanics 2.27, Blacks 3.04). White–Hispanic-differences were reduced from 11.59 to 8.46 IQ, White–Black from 16.33 to 9.94 IQ. If the racial composition of the population had not changed, the mean gain for the 17-year-old group would have been 2.47 IQ points higher. Had the gap between Whites and the two other groups not narrowed, the mean gain would have been 1.70 IQ points lower. Demographic change has accounted for a loss of 2.47 IQ points and according to cognitive human capital theory $2001 GDP per capita per year, but total ethnic gap-narrowing has provided a gain of $1377.

1. Introduction

In the 20th century there was a spectacular rise in intelligence test results (Flynn, 2012; Schaie, 2012). It began in Western countries (US tests with first vs. second world war recruits; Tuddenham, 1948), was detected for Japan (Lynn, 1982) and was followed by a similar development in developing nations (e.g. Brazil: Colom, Flores-Mendoza, & Abad, 2007; Dominica: Meisenberg, Lawless, Lambert, & Newton, 2005; Turkey: Rindermann, Schott, & Baumeister, 2013). Across different decades and countries the average effect per decade was around *dec* = 3 IQ points (Pietschnig & Voracek, 2012) with, in the last decades, some indication of larger improvements in lower scoring groups and countries.

However, if we look at the newer samples in Western countries, it is less clear if the rise is continuing or not. Ongoing environmental improvement could lead to further rises, but differential childbirth rates and increasing immigration may slow or stop the effect. If the secular rise in intelligence means anything, it must result in higher scholastic achievements: The longitudinal National Assessment of Educational Progress (NAEP; Rampey, Dion, & Donahue, 2009) measures the reading and mathematics levels of 9-, 13- and 17-year-old students in representative US samples. Comparable measurements from 1971 to 2008 enable the analysis of trends. Several factors affect the results apart from the fluid intelligence of the students, of which the most important is likely to be the amount and quality of teaching. Variables such as diligence and parental support will have a stronger impact.

There are similarities between scholastic assessment tests and psychometric IQ tests in item content (both usually contain verbal and numerical items), cognitive demands and processes in solving tasks (e.g. analysis of relations, finding of

* Corresponding author.
E-mail addresses: heiner.rindermann@psychologie.tu-chemnitz.de (H. Rindermann), james.thompson@ucl.ac.uk (J. Thompson).

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rules and applying them, categorization, forming of concepts, retrieval of knowledge), applied cognitive abilities (speed, concentration, working memory, fluid intelligence, knowledge), influence of test familiarity and in validity. Empirically, results of psychometric IQ and scholastic tests are highly correlated. Kaufman, Reynolds, Liu, Kaufman, and McGrew (2012) reported a latent correlation of $r_l = .83$ ($N > 2000$) between the Woodcock–Johnson Tests of Cognitive Abilities and the Kaufman Test of Educational Achievement. This result is backed by studies of real-world school achievement: e.g. $r_l = .81$ between General Certificate of Secondary Education scores and Cognitive Abilities Test ($N > 70{,}000$; Deary, Strand, Smith, & Fernandes, 2007) or $r_l = .86$ between Scholastic Assessment Test and Armed Services Vocational Aptitude Battery ($N > 900$; Frey & Detterman, 2004). However, un-corrected correlations are about .20 to .30 lower. At the national level (the one we will use in our analysis) the correlations are even higher (e.g. $r = .89$, $N = 99$ countries; Meisenberg & Lynn, 2011, p. 434). Due to its link to school curricula and knowledge (especially in mathematics), the NAEP test is more likely to tap crystallized than fluid intelligence.

Aside from similarity in items, demands, processes and useful abilities, the common causes of individual development and individual and group differences in both constructs contribute to the observed high correlations. A further reason is within person developmental interaction of abilities: Fluid intelligence (thinking, in a narrower sense intelligence) and crystallized intelligence (knowledge) co-develop in mutual stimulation (Rindermann, Flores-Mendoza, & Mansur-Alves, 2010; van der Maas et al., 2006). All determinants relevant for intelligence development such as genes, health, education in family and school, and classmate ability are also relevant as determinants for achievement in schools and for results in both kinds of tests. For all these empirical and theoretical reasons we can use the NAEP test results measuring reading and mathematics as good indicators of what is usually called intelligence. Due to its link to school curricula and knowledge (especially in mathematics), the NAEP test is more inclined to crystallized than fluid intelligence.

Using these NAEP data we set out to answer four questions:

1 Are abilities continuing to rise in the US?
2 Is the gap between US Whites, Hispanics and Blacks stable, narrowing or increasing?
3 How has the changing demographic composition of the US affected its average cognitive ability?
4 What are the likely impacts on economic growth and wealth in the United States?

2. Method

2.1. NAEP ability data and procedure

The National Assessment of Educational Progress study (NAEP) measures the academic achievement in reading and mathematics (frequently also in science, writing, history, civics, geography, arts, economics) of representative samples of 9-, 13- and 17-year-old students in the US. From 1969 onwards the surveys have been repeated at changing intervals (2, 3, 4 or 5 years). Comparable measurements from 1971 to 2008 enable an analysis of trends. Sample sizes are more than 25,000 students in one assessment year. NAEP is the largest and the nationally most representative and precise study of US student ability.

Reading tasks require students to locate and recall information in texts, to integrate and interpret this information including making comparisons, examining relations, and evaluation (similarly to PISA and PIRLS reading[1]). Apart from word knowledge, which is crystallized intelligence and an important tool in problem solving, the cognitive demands are facets of what is usually called intelligence (the ability to think: to solve new cognitive problems by thinking, to infer, to think abstractly, and to understand). *Mathematics tasks* contain five content areas (number properties and operations; measurement; geometry; data analysis, statistics, probability; and algebra) and are classified according to mathematical complexity. They are similar to school curricula related TIMSS tasks. To solve them intelligence and domain specific knowledge are necessary.

The tasks, the measured competences and the level of difficulty of NAEP and TIMSS are quite similar e.g. "NAEP and TIMSS are similar assessments" and "have similar types of questions" (NCES, 2011, p. 2). "NAEP and TIMSS appear to be quite similar overall in terms of the distribution of items across the low, moderate, and high mathematical complexity levels." (Neidorf, Binkley, Gattis, & Nohara, 2006, p.v). According to their table 8 (p. 31) NAEP has slightly more highly complex mathematics items than TIMSS (3 vs. 2 or 4 vs. 3%, but PISA has 7%). In science "TIMSS has a larger proportion of items measuring factual knowledge, while NAEP has more emphasis on conceptual understanding." (Neidorf, Binkley, & Stephens, 2006, p. vi). There is no hint that NAEP tasks measure only simple retrieval and basic understanding.[2] Both NAEP scales together measure a mixture of general intelligence and specific knowledge, covered by the construct *cognitive ability* (interchangeably with cognitive competence; IQ is a well-established abbreviation). However, compared to figural scales as the Ravens, NAEP scales are more measures of crystallized intelligence.

Although we have results for 9-, 13- and 17-year-old students, the latter are the most important, because they provide a good indicator of the ability level of the later workforce. NAEP samples are collected for representativeness of regions, races, ethnicities and socioeconomic status. Only homeschoolers (2 to 4% of age group) are excluded, but the size of their group does not seem to seriously bias the results. There is no evidence of range restrictions or changes in range restriction for the last decades. However, more young people are now in secondary education (for the U.S. from around 89% in 1975 to 95% in 2009: Snyder & Hoffman, 1991; Snyder & Dillow, 2012). Presumably, today more of the lower ability 17-year-old youth participate in NAEP. Because previously many of the less able students dropped out, this might lead student samples (not general youth samples) to show somewhat declining results. In theory, the exclusion of

[1] *PISA*: Programme for International Student Assessment; *TIMSS*: Trends in International Mathematics and Science Study; *PIRLS*: Progress in International Reading Literacy Study.

[2] Dr. Arnold Goldstein, NCES-NAEP (email, December 21, 2012) says that "we have not found a ceiling effect, as there is much room for the average NAEP scores to increase within our scales".

youth in prisons and changes in confinement rates could bias the results and trends, but in practice confinement rates are small and went down from only 0.4% to 0.2% which is too small to have a noticeable effect.

Rampey et al. (2009) presented data from 1971 to 2008 in 0–500 point scales without giving *SDs*, but with results for percentiles (10th, 25th, 50th, 75th, 90th). From this information *SDs* were calculated and results were transformed into IQs (reading 1971: $M = 100$, $SD = 15$, reference year 1971; mathematics 1978: $M = 100$, $SD = 15$, reference year 1978). The mathematics results for 1973 were only estimated by NAEP. For sum values the reading and mathematics data were averaged after the transformation to IQ.

We have used the earliest *SDs* as constants for all later measurement points (reading: 1971, separately for 9-, 13- and 17-year-old students; mathematics: 1978, separately for 9-, 13- and 17-year-old students). Taking the first *SDs* as a basis makes later *SDs* changes noticeable. For instance, if we want to know something about historical height and weight evolution we as well do not use different yardsticks and scales.

Per decade development was calculated as the mean of two time intervals: The first and last measurement (reading: 1971 and 2008, 37 years divided by 3.7, mathematics: 1978 and 2008, 30 years divided by 3.0) and the second and penultimate measurement (reading: 1975 and 2004, 29 years divided by 2.9, mathematics: 1982 and 2004, 22 years divided by 2.2). By this procedure single measurement year anomalies should be corrected. The total of 37 year increase was calculated using the per decade values (multiplying the per decade change by 3.7). This procedure leads to smoothed trends and to smaller deviations from observed values where a) changes are discontinuous and nonlinear, and b) where values, as for mathematics 1971, were estimated.

NAEP results were presented by Rampey et al. (2009) at the level of scale sums. Individual item data were not provided. Thus *g*-factor analyses (Nyborg & Jensen, 2000; te Nijenhuis, 2012) are not possible.

2.2. NAEP race/ethnicity data

Rampey et al. (2009, pp. 53f.) give information on student demographics (race/ethnicity: "Whites", alternatively "European Americans", predominantly European background; "Hispanics", alternatively "Latinos", coming from Latin America or Middle and South America, "Blacks", alternatively "African Americans", sub-Saharan African background, "Other", mostly East and South Asians). We used NAEP names ("Whites", "Hispanics", "Blacks"). There is no category for students with mixed ancestry. Between 1971 and 2004 the administrator assigned students to a category based on his/her observation; from 2004 onwards the assignment was based on school records. The categorization for unambiguous cases (having no mixed ancestry) seems to be reliable, but since there is no mixed category the categorization of the growing share of students with mixed ancestry is necessarily faulty. Following Cavalli-Sforza (1997, p. 7724) in the second half of 20th century African-Americans had on average 30% of their gene pool from Europeans, in 2008 the percentage is expected to be higher (e.g. Saulny & Steinberg, 2011). We took the NAEP group percentage data averaged across reading and mathematics (Rampey et al., 2009, Tables A-1 and A-2, p. 53f.). Since for 1971 there was no information on Hispanics the results from 1973 and 1975 were used and interpolated for 1971. For the calculations with all three age groups the information for 13-year-old student was used (slightly corrected if data were strongly deviating from other age groups). For the exclusive calculations with 17-year-old students the information provided only for them was used.

Usually, more Black than White students are missing in tests (in the National Longitudinal Survey of Youth sample 15% vs. 10%; Murray, 2006, p. 535). So the given White–Black-gap could be larger, at maximum around 1 to 2 IQ points more. However, there is no indication that this difference is larger today than in past decades. So gap-narrowing is not influenced by this problem.

2.3. Estimating cohort rise, gap-narrowing and demographic change effects

We try to distinguish between four processes: 1. *Pure cohort rise effects* (improving conditions which generally affect children) leading to higher abilities. 2. *Gap-narrowing effects*, improving conditions affecting specific groups of children leading to higher abilities if ethnic minorities catch up with the European majority. 3. *Demographic change effects* (by groups listed in NAEP reports) which may change the overall national level. 4. *Demographic change effects* (by other, not by NAEP listed groups). All these effects combined the result in the observable IQ changes. To correct for any unrepresentativeness of the first and last years in the sequence we used the first two and last two measurement points (at the level of scales, reading: 1971–2008 trend and 1975–2004 trend, math: 1978–2008 trend and 1982–2004 trend; the 1971 measure consists only of reading, the 1975 reading measures correspond to the 1978 math measure) and calculated the average, smoothed trends.

1. We estimated the *pure cohort rise effect* by hypothetically holding gaps (White–Hispanics, White–Black) and population constant. That means we took indirectly the development of the largest subgroup, that was in the past formative for the U.S., Whites, as indicator for an IQ trend independent of any ethnic changes. This makes American developments more comparable to "FLynn effects" in European countries.[3] Additionally, it makes gap-narrowing and population-change effects visible.
2. The *gap-narrowing effect* was calculated by assuming no demographic change from 1971 to 2008 and subtracting the 1971 gap from the 2008 gap to calculate the entire students' group average. The (smoothed) difference was the cognitive ability increase for the total cohort due to the gap-narrowing effect (in absolute terms).
3. The *demographic change effect* was calculated by taking the 2008 NAEP group ability values and the 2008 group percentages and then applying the 1971 ethnic demographic percentages. We calculated what the results would have

[3] "FLynn effect", a combination of the names of the two men who rediscovered secular score gains in intelligence, namely Richard Lynn (1982) and James Flynn (1984). This does not mean that there are no former or further researchers dealing with this topic (e.g. Schaie, 2012, and see the historical overview by Lynn, 2013–this issue).

been in 2008 if the demographics had not changed. However, NAEP group suffer from lacking information on non-White, non-Hispanic and non-Black ethnic groups (we assume mainly Asians and among them mainly East-Asians).
4. The *other group effect* was calculated by the difference between the sum of the first three effects and the observable NAEP-IQ change.

To sum up:

$$NAEPIQ_{Change} = CR + GN + DC + OG$$

$NAEPIQ_{Change}$ observable NAEP changes between 1971 and 2008 transformed to IQ (also named as general IQ rise or FLynn effect), based on reading and mathematics.
CR pure cohort rise effects, based on Whites.
GN rise going back to gap narrowing (Hispanics and Blacks caught up).
DC rise or decline going back to changing demographic composition as listed by NAEP for Whites, Hispanics and Blacks.
OG effect on observable NAEP changes attributed to rising proportions of other groups not explicitly listed by NAEP.

2.4. Economic estimates

To estimate economic effects we used 2010 per capita GDP based on 2010/2011 dollar purchasing-power-parity (World Economic Outlook Database April 2011; IMF, 2011). We used a correlation between cognitive ability and wealth of $r = .53$ (Rindermann, 2007, 2012). In regressions one IQ-point corresponds to a gain of 810 US dollar per capita per year and we applied it to IQ-transformed NAEP-means between 1971 and 2008.

3. Results

3.1. General IQ rise (observable NAEP changes): Continuing, but far less so for 17 year old students and for high ability students

The mean overall achievement level (across the two dimensions and three age groups) rose by +4.34 IQ points in 37 years (see Table 1 and Fig. 1). The mean increase per decade is $dec = +1.17$ IQ. This increase is well below the 20th century western average of $dec = +3$ IQ; nevertheless, it shows an ongoing rise in crystallized ability, though below the international average for the second half of past century. The average increase per decade is smaller in reading (0.54) than in mathematics (2.37). The average increase is higher in younger groups (9 years 2.02, 13 years 1.20, 17 years 0.30). The increases for 17-year-old students are small to zero (no increase in reading: $dec_{Read17y} = -0.01$, small in mathematics: $dec_{Math17y} = 1.27$). This age decline in the FLynn effect is observed for Whites, Hispanics and Blacks. Assuming that the ability of 17-year-olds is the most relevant for the performance of the later workforce, particularly those in the STEM category, then there was a small but useful increase in mathematics (see also Fig. 3).

The second important result is that *SDs* are decreasing (see Table 1, in parentheses), from $SD = 15.00$ in the early 1970s' to $SD = 13.56$. The decline per decade is smaller for reading ($dec_{SDRead} = -0.10$) than for mathematics ($dec_{SDMath} = -0.56$). There is no systematic difference between the ages (9 years = −0.39, 13 years = −0.31, 17 years = −0.43).

If we compare the two most extreme ability levels (10th and 90th percentiles) there is a larger increase at the bottom (1.79) than at the top (1.03). Among the 17-year-old students there is no improvement at the high ability level ($dec_{17y10\%} = 1.09$ vs. $dec_{17y90\%} = 0.08$).

3.2. Ethnic ability gaps: Narrowing, but White–Black-convergence has stopped

The NAEP data show that the ability gaps between Whites (European ancestry) and Hispanics (Middle and South American ancestry) and between Whites and Blacks (African ancestry) are diminishing: For Hispanics from 11.59 to 8.46 IQ points, for Blacks from 16.33 to 9.94 IQ points (see Table 2 and Fig. 2). The gaps decreased by (smoothed) 3.63 and 6.49 IQ points respectively, and per decade at (smoothed) $dec_{Diff} = -0.98$ and −1.75 IQ points. There are no large differences between all three ages (first three rows of Table 2 vs. last three rows; Figs. 2 and 4 compared).

If instead of using the standard deviations of the 1970s we had used the current 2008 standard deviations then the differences would have become slightly larger (total group: for White–Hispanic instead of 8.46 then 9.36 IQ points; for White–Black instead of 9.94 then 11.11 IQ points; 17-year-old group: for White–Hispanic instead of 8.68 then 9.73 IQ points; for White–Black instead of 10.43 then 11.76 IQ points).

Nevertheless, while the 70s and 80s were the time of gap narrowing, this general trend stopped from the 90s onward (see Figs. 2 and 4).

3.3. Population change effects: Impeding cohort gains, but only partly

We distinguish four differently working processes across time: 1. *Cohort rise effect*. 2. Ethnic *gap-narrowing*. 3 + 4. *Demographic changes* as documented or not documented by NAEP.

According to NAEP statistics (Rampey et al., 2009, p. 53f.) the student population has changed considerably from 1971 to 2008 with Whites down from 82% to 57%, Hispanics rising from 4% (interpolated) to 20% and Blacks rising from 13% to 16% (see Fig. 5).[4]

How do the four single processes contribute to the development of cognitive achievement across cohorts? We do mathematical calculations by varying one factor and holding the other constant (cohort rise effect, gap-narrowing, demographic change, other group). The *cohort rise effect*

[4] Demographic changes co-vary with cultural and political changes such as educational selection procedures, support for meritoric principles (Sowell, 2004), welfare expenditures and social feed-back effects (the competence level of students in school influencing instruction and learning) which are hard to disentangle.

Table 1
NAEP development 1971–2008 for reading and mathematics, 9-, 13- and 17-year-old students, means and standard deviations.

Year scale	r1971 m1973	r1975 m1978	r1980 m1982	r1984 m1986	1988	1990	1992	1994	1996	1999	2004	2008	Sum 37 y	Per Dec.
Read 9 years	100.00	100.71	102.49	101.07	101.42	100.36	101.07	101.07	101.42	101.42	103.91	104.27	+4.17	+1.13
	(15.00)	(13.72)	(13.31)	(14.73)	(14.73)	(16.08)	(14.59)	(14.59)	(14.05)	(14.12)	(13.31)	(12.84)	(−1.34)	(−0.36)
Read 13 years	100.00	100.42	101.26	100.84	100.84	100.84	102.10	101.26	101.26	101.68	101.68	102.10	+1.85	+0.50
	(15.00)	(14.92)	(14.75)	(15.00)	(14.60)	(15.00)	(16.36)	(16.44)	(16.28)	(16.19)	(15.56)	(15.24)	(+0.53)	(+0.14)
Read 17 years	100.00	100.33	100.00	101.32	101.65	101.65	101.65	100.99	100.99	100.99	100.00	100.33	−0.05	−0.01
	(15.00)	(14.31)	13.68)	(13.31)	(12.30)	(13.68)	(13.94)	(14.50)	(13.87)	(13.69)	(14.13)	(14.56)	(−0.34)	(−0.09)
Read mean	100.00	100.49	101.25	101.08	101.30	100.95	101.61	101.11	101.22	101.36	101.86	102.23	+1.99	+0.54
	(15.00)	(14.31)	(13.92)	(14.34)	(13.88)	(14.92)	(14.96)	(15.18)	(14.73)	(14.67)	(14.33)	(14.22)	(−0.38)	(−0.10)
Math 9 years	100.00	100.00	100.00	101.24	–	104.55	104.55	104.96	104.96	105.37	109.09	109.92	+13.76	+3.72
	(–)	(15.00)	(14.45)	(14.21)	(–)	(13.74)	(13.82)	(13.90)	(14.21)	(14.29)	(13.59)	(13.67)	(−1.55)	(−0.42)
Math 13 years	100.77	100.00	101.92	101.92	–	102.30	103.45	103.83	103.83	104.60	106.51	106.51	+7.88	+2.13
	(–)	(15.00)	(12.96)	(11.87)	(–)	(11.94)	(11.73)	(12.24)	(12.02)	(12.45)	(12.38)	(12.68)	(−1.92)	(−0.52)
Math 17 years	101.67	100.00	99.16	100.84	–	102.09	102.92	102.51	102.92	103.34	102.92	102.51	+4.71	+1.27
	(–)	(15.00)	(13.89)	(13.02)	(–)	(13.41)	(12.86)	(12.70)	(13.09)	(13.09)	(12.54)	(12.39)	(−2.75)	(−0.74)
Math mean	100.81	100.00	100.36	101.33	–	102.98	103.64	103.77	103.90	104.44	106.18	106.31	+8.78	+2.37
	(–)	(15.00)	(13.77)	(13.03)	(–)	(13.03)	(12.80)	(12.95)	(13.11)	(13.28)	(12.84)	(12.91)	(−2.07)	(−0.56)
IQ-sum	100.41	100.24	100.80	101.20	101.30	101.96	102.62	102.44	102.56	102.90	104.02	104.27	+4.34	+1.17
	(15.00)	(14.66)	(13.84)	(13.69)	(13.88)	(13.98)	(13.88)	(14.06)	(13.92)	(13.97)	(13.58)	(13.56)	(−1.40)	(−0.38)
IQ-sum 17 years	100.84	100.17	99.58	101.08	101.65	101.87	102.29	101.75	101.96	102.17	101.46	101.42	+1.12	+0.30
	(15.00)	(14.66)	(13.79)	(13.16)	(12.30)	(13.55)	(13.40)	(13.60)	(13.48)	(13.39)	(13.33)	(13.47)	(−1.61)	(−0.43)

Notes: First (top) value is mean in IQ-metric, second (bottom in parentheses) is *SD*; if two years listed: first (top, "r") year is the year of the reading survey, second (bottom, "m") year is mathematics survey; sum: change from 1971 to 2008 calculated from smoothed average decade change multiplied with 3.7 (for mathematics 2 years as estimated added); per dec.: average increase per decade (sum and reading: mean of 1971-2008 and 1975–2004 development; mathematics: mean of 1978–2008 and 1982–2004 development; if chosen for mathematics extrapolated 1973 instead of 1978 and 1978 instead of 1982 the mean increase is smaller, instead of $dec = 2.37$ now $dec = 1.97$; however the mathematics increase is still much larger than in reading).

(based on the White subgroup) is 4.77 for 37 years which comes to $dec_{CR} = 1.29$ (remember the total effect was $dec = 1.17$; see Table 3).

Similarly we calculated the *pure gap-narrowing effect* by controlling for the cohort effect and holding demographics constant. This pure gap-narrowing effect is 1.01 for 37 years which comes to $dec_{GN} = 0.27$.

We calculated the *demographic change effect* by eliminating the cohort and gap-narrowing effects. This demographic change effect is −1.83 for 37 years which comes to $dec_{DC} = -0.49$.

Finally, the unknown "Other" groups have to contribute 0.39 IQ (or per decade $dec_{OG} = 0.10$) to the total increase of 4.34. Without this group the increase of $dec = 1.17$ would be 0.10 IQ-point smaller, down to $dec = 1.07$.

If we look at the 17 year old students, who about to enter the economy, they show a total gain of $dec_{17y} = 0.30$ which is made up of a cohort rise of $dec_{CR17y} = 0.45$, plus an ethnic gap-narrowing gain of $dec_{GN17y} = 0.25$ minus a demographic loss of $dec_{DC17y} = -0.67$ plus an other group gain of $dec_{OG17y} = +0.27$. Without the other group (probably Asians), there would have been no gain at all.

3.4. Wealth effects: Smaller than expected

The achievements of 17-year-old students provide the best indicator for the ability level of the active workforce in

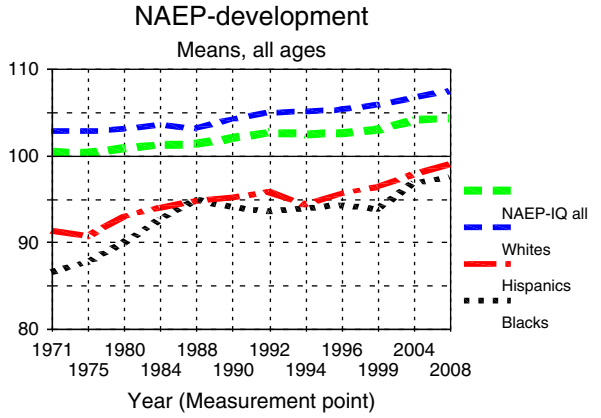

Fig. 1. Development of NAEP-mean (across competences, age and ethnic groups) and separately for ethnic groups.

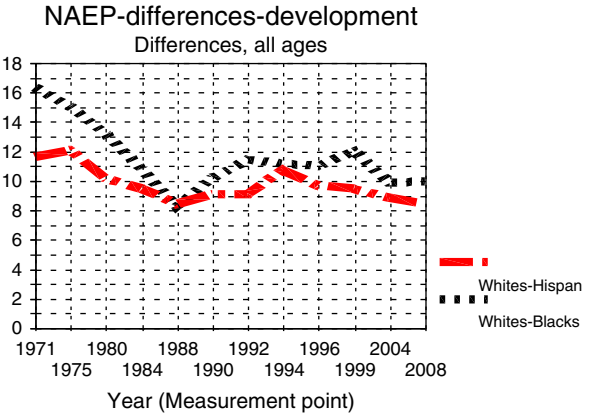

Fig. 2. Development of ethnic differences in NAEP-mean (across competences and age groups).

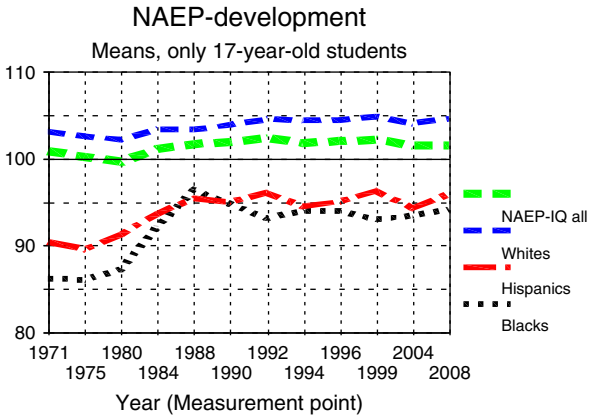

Fig. 3. Development of NAEP-mean for the socially more relevant 17-years group (across competences and ethnic groups) and separately for ethnic groups.

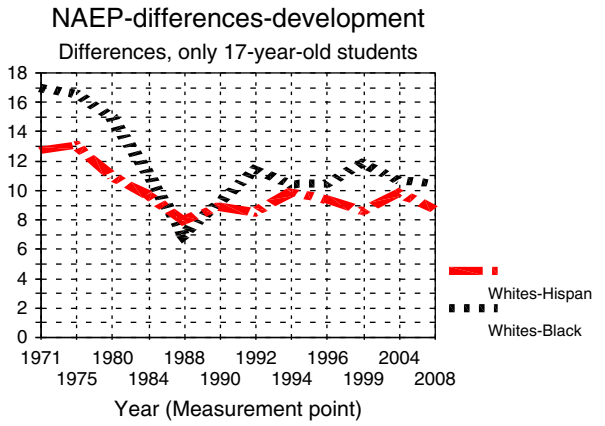

Fig. 4. Development of ethnic differences in NAEP-mean for the socially more relevant 17-years group (across competences).

the coming 50 years. We calculated possible wealth productivity effects (in current US Dollar, 2010/2011). Internationally, one IQ point corresponds to $810 higher average productivity per capita per year (Rindermann, 2012). Between 1971 and 2008 17 year olds' ability level increased by 1.12 IQ points, representing a productivity gain of $907. But the real wealth increase was much higher, from $20,856 in 1971 to $42,731 in 2008 (at 2005 constant prices, ppp converted GDP per capita, derived from growth rates, source Penn World Table Version 7.1; Heston, Summers, & Aten, 2012).

According to cognitive human capital theory a sufficient cognitive ability level makes economic growth possible. A *change* in cognitive ability at the national level influences the *growth* rate (e.g. instead of 2.0%, 2.2% economic growth). A zero FLynn effect does not correspond to zero growth. At a high national ability level (as in the US) zero FLynn effects mean – ceteris paribus – a non-changed long-term growth line. However, there is *no* "ceteris paribus": with the growing complexity of technological, organizational, social and financial development (only except for a dwindling number of manual jobs); after picking low hanging fruits; and after (for emerging countries) having used up the advantages of backwardness by reaching the first lines of progress, a higher cognitive ability level is necessary for future growth.

Hypothetically assuming a non-changing racial-ethnic population (for 17-year-old 2008 as if 1971: 86% Whites, 11% Blacks, 2% Hispanics, instead of actually 59% Whites, 14% Blacks, 19% Hispanics), the mean gain would have been 2.47 IQ points higher. This would represent an average annual per capita higher productivity in the US of $2001. For the entire country these would be 628 billion per year or around 4% of GDP. However, for the present these are rough overestimates because the younger generations only gradually replace the older generations. Because the effects are lasting, the estimates are true for the long run.

More positively, ethnic gap-narrowing contributed to a substantial IQ increase; a plus of 0.92 IQ (17-year-old sample) represents $745 per year per capita. However, the "gross" effect also acknowledging a changing population is even larger: Gap-narrowing becomes more important and shows larger total society effects if the proportion of (relative to others) low

Table 2
NAEP means and gap development 1971–2008 for Whites, Hispanics and Blacks (reading and mathematics average).

Year Group	r1971 m1973	r1975 m1978	r1980 m1982	r1984 m1986	1988	1990	1992	1994	1996	1999	2004	2008	Sum 37 y	Per Dec.
Whites (European A.)	102.85	102.74	103.10	103.45	103.12	104.18	104.92	105.06	105.26	105.79	106.64	107.41	4.77	1.29
Hispanics (Latin A.)	91.26 (11.59)	90.66 (12.07)	92.95 (10.15)	93.98 (9.46)	94.70 (8.42)	95.10 (9.08)	95.80 (9.11)	94.33 (10.73)	95.60 (9.66)	96.35 (9.44)	97.81 (8.83)	98.95 (8.46)	8.41 (−3.63)	2.27 (−0.98)
Blacks (African A.)	86.52 (16.33)	87.69 (15.04)	89.89 (13.21)	92.62 (10.83)	94.86 (8.27)	94.01 (10.17)	93.50 (11.42)	93.90 (11.16)	94.26 (11.01)	93.79 (12.01)	96.77 (9.87)	97.47 (9.94)	11.27 (−6.49)	3.04 (−1.75)
Whites 17 years (European A.)	103.08	102.57	102.16	103.32	103.30	103.86	104.49	104.32	104.37	104.78	104.04	104.57	1.68	0.45
Hispanics 17 years (Latin A.)	90.39 (12.69)	89.54 (13.03)	91.23 (10.92)	93.64 (9.68)	95.38 (7.92)	95.01 (8.85)	96.02 (8.47)	94.49 (9.83)	95.03 (9.34)	96.23 (8.56)	94.24 (9.80)	95.90 (8.68)	5.75 (−4.07)	1.55 (−1.10)
Blacks 17 years (African A.)	86.14 (16.94)	86.05 (16.52)	87.22 (14.94)	92.15 (11.17)	96.37 (6.93)	94.73 (9.13)	93.11 (11.37)	93.94 (10.38)	93.94 (10.43)	92.98 (11.80)	93.40 (10.64)	94.15 (10.43)	8.69 (−7.01)	2.35 (−1.89)

Notes: First three rows all age groups averaged (9-, 13- and 17-year-old students); the final three rows only for 17-year-old students (17 years); if two years listed: first (top, "r") year is the year of the reading survey, second (bottom, "m") year is mathematics survey; group names: first by NAEP used labels, then their geographical origin; sum: change from 1971 to 2008 calculated from smoothed average decade change multiplied with 3.7; in parentheses for Hispanics and Blacks: difference to White average; average in reading and mathematics; the means of Tables 1 and 2 do not exactly fit because the group "Other", increasingly consisting of Asians, is not considered (no results by NAEP presented).

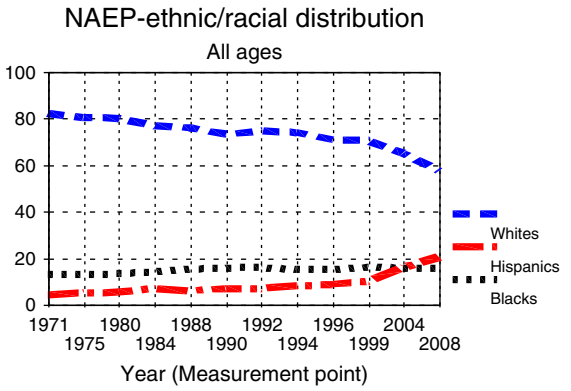

Fig. 5. Development of ethnic/racial distribution among students according to NAEP (across age groups).

ability, but catching up groups is increasing. This total effect of 1.70 IQ represents $1377 per capita ($432 billion or around 3% of GDP).

4. Discussion

4.1. A triple success story: Ability rise continued, math up and gaps are narrowing

The secular rise in cognitive ability is still continuing in the United States, but at a low rate. Contrary to Bishop's (1989) analyses of the 1970s' and 1980s' student achievement tests there are no declines in the U.S. However, compared to the 20th century standard of per decade $dec = 3$ IQ points the NAEP increase of $dec = 1.17$ IQ is only one third as big. The stronger increase at younger ages vanishes with age ($dec_{9y} = 2.02$, $dec_{13y} = 1.20$, $dec_{17y} = 0.30$ IQ).

There is a difference in changes across time between *reading* (low increase, $dec_{Read} = 0.54$ IQ) and *mathematics* (larger increase, $dec_{Math} = 2.37$ IQ). This is not exclusively a NAEP phenomenon: Wai, Putallaz and Makel (2012, p. 388, only information about the top 5%) also reported it for the SAT and ACT (SAT: $dec_{Read} = -0.50$ vs. $dec_{Math} = 1.70$ IQ, ACT: $dec_{Read} = 0.30$ vs. $dec_{Math} = 4.50$ IQ). In a world of growing demands in technology and science a larger increase in mathematical ability is quite welcome. However, reading not only covers the interpretation of poems and novels, but also a more general understanding and reasoning.

There is a threefold statistical evidence for a *growing homogeneity* in abilities: First, standard deviations declined, from $SD = 15.00$ (by definition) in 1971 to 13.56 IQ ($dec =$ -0.38 in 2008). Second, achievements rose more at the lower ability level than at the higher ($dec_{10\%} = 1.79$ vs. $dec_{90\%} = 1.03$; similarly Bishop, 1989). Third, achievements of African Americans (Blacks) and Latin American Americans (Hispanics) rose more than those of European Americans (Whites) (similarly Bishop, 1989): $dec_{Black} = 3.04$, $dec_{Hispan} = 2.27$ and $dec_{White} = 1.29$ IQ, leading to more narrow gaps (White–Hispanic-difference from $diff = 11.59$ to 8.46 IQ, White–Black-difference from $diff = 16.33$ to 9.94 IQ). Ability distributions are today more overlapping than in the past.

This US development could be compared to the developments in Europe where ability gaps between natives and immigrants from Arabian-Muslim and African countries have narrowed, but haven't disappeared (te Nijenhuis, de Jong, Evers, & van der Flier, 2004).

But there are three disappointments: White–Black-gap-narrowing stopped in the late eighties, as also found by other measures (highest educational degrees, Graduate Record Exam, SAT, ACT; Barton & Coley, 2010; Farron, 2010, pp. 293-295; Neal, 2006; Rushton & Jensen, 2006); the competence level of high ability groups has hardly risen; and school leaver (17-year olds) have hardly achieved any gains.

4.2. Why the increase in homogeneity?

Lower-ability groups (10%-percentiles, Blacks, Hispanics) have caught up, and higher ability groups (90%-percentiles, Whites) have slowed down in their long-term ability rise. Declining heterogeneity in abilities in the general population and between different ethnic-racial groups may be a response to policy imperatives aimed at reducing social, ethnic and racial tensions. And, as in other fields, to improve below average conditions is easier than to improve already satisfactory ones ("low hanging fruits", "observational learning", "advantages of backwardness").

4.3. Why does the mean continue to increase?

There is a continuing improvement of environmental conditions, e.g. better prenatal and child health care, more and better pre-school education, longer education for youth, and more mental stimulation from the Internet and gadgets. There are important lagging effects across generations, e.g. adults that have grown up as children in a more beneficial environment and kept longer in school can provide their own children with a more beneficial developmental environment. Even if the environment is not continuing to be improved, the past improvements will have positive effects for today's generations. However, possible environmental deterioration, changes in culture and demographics could interfere with environmental improvements.

Table 3
Contributing factors to the NAEP development 1971–2008 (IQ effects).

Age group effect	All age groups		17-year-old Students	
Interval	37 years (est.)	Per decade	37 years (est.)	Per decade
Cohort rise	4.77	1.29	1.68	0.45
Gap-narrowing	1.01	0.27	0.92	0.25
Demographic change	−1.83	−0.49	−2.47	−0.67
Other group	0.39	0.10	0.99	0.27
Total	4.34	1.17	1.12	0.30

4.4. Why only a modest increase of around 1 IQ per decade?

In the 20th century a gain of about 3 IQ points per decade was usual (Flynn, 2012; Pietschnig & Voracek, 2012). The much smaller past decades' US NAEP increase of *dec* = 1.17 needs an explanation. Bishop (1989) and Wai et al. (2012) also did not find higher trends for the last decades. First, there are *limits to cognitively relevant environmental improvability*. E.g. improvement in nutrition may have most impact if nutrition is very poor (Eysenck & Schoenthaler, 1997). Once preschool education is introduced, preschool extension or quality improvement has less impact and less for the average or higher end distribution. Changes in instruction have a much smaller effect than past prolongation of education (e.g. from five to twelve years) and extension of education (e.g. not only for urban white upper class, but also in remote areas for children of less educated parents) (Ceci, 1991). Environmental improvements reach a point of diminishing returns.

Second, *environments and cultures can deteriorate*: e.g. cognitively challenging subjects can be replaced by less challenging and sometimes politically biased subjects (Sowell, 1993). Well qualified women graduates may ignore teaching careers for better paid work, and less qualified graduates may chose teaching as a last resort (Dolton & Marcenaro-Gutierrez, 2011; Eide, Goldhaber, & Brewer, 2004; Hanushek & Woessmann, 2011).

Third, *affirmative action and grading* could have complicated the results, generally undermining the quality of grades for all ethnic groups (Lott, 2000; McWhorter, 2000; Sowell, 2004). Imperfect information on ability leads to underinvestment in ability development, the use of low quality proxy variables and misallocation of human capital.

Fourth, *demographic changes have immediate and delayed effects on national attainment*. Immigration and high birth rates of less educated groups lower overall results. Without population change the ability rise per decade would have been a half an IQ point larger (instead of *dec* = 1.17 *dec* = 1.66), and among the 17-year-old students two thirds of an IQ point larger (instead of *dec* = 0.30 *dec* = 0.97). The impact of this change is mitigated by the larger FLynn effect among those groups.

NAEP does *not measure fluid intelligence* with figural tasks where usually the gains are the largest (Flynn, 2012). However, "crystallized" intelligence ("fluid" intelligence combined with knowledge and its intelligent use) is for the achievement in the job and in everyday life more important than pure "fluid" brain power (Postlethwaite, 2011). Finally, the *increase in school attendance* (for the US from around 89% in 1975 to 95% in 2009) will bias somewhat the NAEP sample results (students with weaker performance will in the past have left the school, now they are in the sample).

4.5. Why does the NAEP rise show an age-decline?

Why did younger children gain more than older ones? Usually we would assume that cognitive development (including knowledge acquisition) is a cumulative process. Five explanations for an "age-FLynn-decline" have been presented:

1. Nutritional and environmental improvements in society have *simply speeded up* child development, but have not affected final completed maturational achievement (e.g. Woodley & Meisenberg, 2012). Earlier puberty would fit in with this pattern.
2. Among older youth the *influence of genetic factors increases* (e.g. Johnson, 2010). So the positive influence of environmental improvements is weakened by the growing influence of genes in individual development.
3. There had been *more effective reforms* in pre-K and kindergarten. Their effects are petering out with age.
4. Today there is a *stronger negative peer pressure in adolescence* against learning and doing well at schools than one generation ago. Gains in earlier age are neutralized by this counter development.
5. *Instructional quality in secondary school* improved less than in primary and even *deteriorated*, e.g. lower teacher quality or educational experiments and an anything-goes approach in course choice.

Further possible explanations (good students leave the school system, low ability immigrants are older when they come to the U.S.) are not plausible.

4.6. Why was the gap narrowing?

Closing the ability gap is seen as the most way to reduce racial/ethnic differences in educational success, income, wealth, housing, and criminality (e.g. Hanushek & Rivkin, 2009). The White–Black-gap has been observed in many countries (Lynn, 2008) and it is internationally larger (Africans in Africa vs. Europeans in Western countries; Rindermann, 2013). According to the NAEP results the gap is now smaller in the US than the past benchmark of 15 IQ (d = 1; Roth, Bevier, Bobko, Switzer, & Tyler, 2001).

Gap-narrowing means that factors relevant for the gap have changed in their magnitude, or their stable effects are countered by new other factors. Causes for the gap are seen by different researchers as falling at either side of the wide spectrum of nature and nurture factors (e.g. Nisbett et al., 2012; Rushton & Jensen, 2005). One important environmental cause of gap-narrowing in the 20th century was the *end of political segregation and discrimination*. Of course, NAEP started later, but lagging transgenerational effects via families and general changing society conditions is still relevant today. Other positive effects were *wealth increases* (leading to better nutrition and health services, particularly for lower SES groups), *improvement of education* especially for *Blacks* in the south (e.g. Rosenwald Schools; Neal, 2006, p. 535), *selective support* (e.g. federal and state support for inner city schools, schools attended by Blacks receive today, on average, slightly more recourses than schools attended by Whites; Neal, 2006, p. 566), the *extension of education* (at pre-school and later youth age), general *improvement of education*, introduction of regular *ability testing*, larger expenditures in *remedying education* at different levels of disadvantage, easier access to *information* and *media*, all especially effective at the poorer and lower ability levels (e.g. Barton & Coley, 2010). Finally, growing shares of people with mixed ancestry although still categorized as minority group members, lead to *growing genetic similarity* (Cavalli-Sforza, 1997, p. 7724; Saulny & Steinberg, 2011).

4.7. Why has gap-narrowing stopped?

But why is there no further ability convergence? We judge this halt, considering the ongoing environmental improvements and political support, as the greater puzzle than the highly plausible past gap-narrowing. As regards the White–Black-gap, obvious disadvantages have been remedied. However, there were described detrimental developments as in the labor market, role models, motivation and orientation.

External and internal "shocks" hit African Americans indirectly impairing the environmental quality for children and adolescents (Neal, 2006, pp. 558ff.): Globalization has led to *falling real wages* for less skilled workers, among whom Blacks are overrepresented. At the below average levels, learning and hard work seem not to lead to positive outcomes. Politically set high minimum wages lead for less skilled to higher unemployment. The *crack and cocaine epidemic* hit Black communities harder. *Single mother families*: in 1960 33% of Black children were living with one or no parent, 9% of Whites, but in 2005 65% Blacks compared to 26% Whites, the difference increased from 24 to 39% (Barton & Coley, 2010, p. 23; see also Moynihan, 1965). *Fathers disappeared*: Fathers are, among poorer families on welfare, economically no longer necessary; African men are more likely be unemployed or institutionalized (14.1% of 20- to 24-year-old male Blacks are institutionalized vs. 2.7% Whites, Hanushek & Rivkin, 2009, p. 368). *Fraud* increased among education, e.g. 2011 in Atlanta 178 teachers and directors were charged with "organized and systemic misconduct" in dealing with No-Child-Left-Behind-Tests (New York Times, 2011). *Affirmative action* and *affirmative grading* affect achievement motivation in the preferred groups and positively biased feedback (Harber, 1998; Harber et al., 2012) leads to overrated ability self-concept impeding hard work.[5] This discredits for entire society meritoric principles.

For both Hispanics and Blacks: More white mothers *breastfeed* their infants and more white mothers *read to their children* (Fuller et al., 2009). Cognitive ability differences appear before traditional kindergarten entrance age (around $d = 0.65$ or 10 IQ points at age 2 in the Bayley Mental Scale between Whites vs. Blacks or Hispanics; Fuller et al., 2009). Hispanics as well as Blacks more frequently do not reach high school diploma (2008 dropout rate for ages 20 and older: Whites 14%, Hispanics 41%, Blacks 23%; Fry, 2010). This has negative effects on their intelligence and long-term negative effects on their children's cognitive development (parental educational level is the most important predictor for children's intelligence). *New incoming Hispanic immigrants* with lower educational levels (Fry, 2010) *level out* the gains achieved for second or subsequent generation Hispanic immigrants.

Finally, researchers see the main problem for African American children's development in *environmental conditions shaped by themselves*. E.g. Barton and Coley (2010) see a crucial factor in living in "disadvantaged", mainly self-created neighborhoods (physical inner city dilapidation, houses, streets, playgrounds and cars, cultural-social decline through disappearing fathers, out of wedlock births, drug abuse, criminality, anti-achievement models). Steinberg (1996) discussed this problem, and suggests reforms. Similarly Fryer and Levitt (2004) found that the most hindering factor was not the schools' instructional quality and educational policies but the immediate environment *outside* the school:

> "Interestingly, along traditionally considered dimensions of school quality (class size, teacher education, computer: student ratio, and so on), blacks and whites attend schools that are similar. On a wide range of nonstandard school inputs (including gang problems in school, percentage of students on free lunch, amount of loitering in front of school by nonstudents, amount of litter around the school, whether or not students need hall passes, and PTA funding), blacks do appear to be attending much worse schools." (p. 448)

Hanushek and Rivkin (2009) mentioned high percentages of Black children in a school as the most important detrimental factor, especially for high achieving Black students (high percentage of Hispanics has no negative effect).

Growing school attendance rates among older Hispanics and Blacks are not relevant; school attendance rates increased for all, but not differently.[6] Additionally, the size of longitudinal gap-narrowing across different ages is comparable (for White–Hispanics, $dec_{GN9y} = -0.85$, $dec_{GN13y} = -1.00$, $dec_{GN13y} = -1.10$; for White–Blacks, $dec_{GN9y} = -1.36$, $dec_{GN13y} = -2.01$, $dec_{GN13y} = -1.89$). Because NAEP sample increases could have only happened in higher ages (the younger children went already in the 1970s to school) any slowing down of gap-narrowing has to happen more in the older groups what is not the case. The gap-narrowing in this time is even larger among the older groups!

Often assumed *motivational factors* as acting white or stereotype threat seemed also not to be relevant. Initially positive evidence could not be backed by other studies; e.g. African Americans seem to have similar motivation or even better than Whites (Tyson, Darity, & Castellino, 2005); apart from small stereotype threat effects there are larger ability effects (Sackett, Hardison, & Cullen, 2004).

The fact that the national environment (distal and external) is now much better than before, in terms of inherent school quality and supporting policies, and the fact that the gaps are no longer narrowing, suggests that the environments that individuals and groups create for themselves (proximal in time and near in geography) may be the causes of persistent under-performance. This begs the question why some groups do a less good job of managing their environments. Apart from *cultural theories* (including family, motivation and orientation)

[5] McWhorter (2000, pp. 233): "In secondary school I quite deliberately refrained from working to my highest potential because I knew that I would be accepted to even top universities without doing so. Almost any black child knows from an early age that there is something called affirmative action which means that black students are admitted to schools under lower standards than white; I was aware of this from at least the age of ten. And so I was quite satisfied to make B+'s and A−'s rather than the A's and A+'s I could have made with a little extra time and effort. … In general, one could think of few better ways to depress a race's propensity for pushing itself to do its best in school than a policy ensuring that less-than-best efforts will have disproportionately high yield."

[6] 1975 89% of 16 and 17 years old Whites attended school (and are part of the NAEP target population), 87% of Blacks and 86% of Hispanics; 1985: 92%, 92% and 85%; 2005; 96%, 94% and 93% (Snyder & Dillow, 2012, p. 22; Snyder & Hoffman, 1991, p. 16).

genetic hypotheses interpret family and neighborhoods as *extended phenotype effects*, reproduced again and again in various environments (Dawkins, 2008/1992). There is some evidence (independent of any racial distinctions) that genetic factors contribute to international cognitive ability differences (Rindermann, Woodley, & Stratford, 2012). However, so far no genes for cognitive ability have been found influencing cognitive ability directly, via neurological development, or indirectly via changing environment and lifestyles. The last compelling proof is still missing (Hunt, 2011).

4.8. Why are the increases larger in lower ability groups?

Larger increases at the lower end are well-known from other studies in other countries (e.g. Colom, Lluis-Font, & Andrés-Pueyo, 2005). In general it is much easier to improve conditions in lower-quality environments ("low-hanging fruits"). Also, educational reforms have been targeted on lower-ability groups. Finally, better nutrition may have most impact on low ability groups (Colom et al., 2005).

4.9. Why have the brightest not noticeably improved?

The competence level at the at the 90th percentile rose per decade at only $dec_{90\%} = 1.03$, the particularly important 17-year-old high achiever group showed only a negligible improvement ($dec_{17y90\%} = 0.08$, in 37 years 0.30 IQ). Wai et al. (2012, p. 388) also reported only a small average increase of $dec = 0.80$ for the top 5% in SAT and ACT in the last three decades. People at all ability levels can contribute to wealth production but the crucial determinant for economic growth is innovation and mastery of cutting-edge technology ("cognitive capitalism"; Rindermann, Sailer, & Thompson, 2009). The possible lack of increases in such eminent intellects raises doubts for the future (Homer-Dixon, 2000; Hunt, 1995; Hunt & Madhyastha, 2012; Woodley, 2012).

Since school leavers at the 90th percentile get only 306 points out of a possible 500, ceiling effects seem to be unlikely. Instead, the US educational system seems to be unenthusiastic about programs for the gifted (Subotnik, Olszewski-Kubilius, & Worrell, 2011). In a post-modern "broader" concept of giftedness, objective achievement tests are often replaced by subjective assessments, leading to the furtherance of less gifted students. Political criteria accompany ability based admission standards and at least partly substitute for them (an example is given by Borland, 2012). Some even see an "anti-merit crusade" (Weissberg, 2010, p. 113, 119). Additionally, *environmental improvements* are reaching a natural *ceiling*, limiting the headroom for high ability groups.[7] After one century of melioration a *peak IQ* set by genetics has been reached. Finally, *educated people have fewer children*, reducing their genetic and cultural contribution to the next generation.

[7] One reviewer mentioned, that nobody can know whether and when the limits are reached. However, the last centuries large improvements in many environmental conditions and given biological and neurological constraints (e.g. compare to body size) make it not probable that the development will continue in similar speed. Of course, we are no prophets!

5. What should and can be done?

Because FLynn effects seem to peter out the focus for future ability gains has to be laid on narrowing ability gaps in an upward direction. Generally, *meritoric principles* have to be reestablished. One simple means, practiced in many countries of the world, is to use *blindly graded objective central exams* from primary to tertiary education, raising ability (Bishop, Moriarty, & Mane, 2000; Rindermann & Ceci, 2009). Non-meritoric, ethnically based policies are dysfunctional for ability improvement and development of society. *Counseling* and *training programs* should support parents to provide benign developmental conditions like breast feeding, reading and speaking with the child (Protzko, Aronson, & Blair, 2013).

For the gifted there are many well-known high ability programs including *acceleration*, *pull-out programs*, *enrichment* and *early streaming* according to objectively measured competences (e.g. Subotnik et al., 2011). The U.S. has benefited from *high-ability immigration* in high tech industries and universities (e.g. Wadhwa, 2012). Targeted immigration policies to bring in talent could compensate for national shortcomings in education and demographic policies, at least as long as the United States remains attractive for cognitive classes.

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