The social and scientific temporal correlates of genotypic intelligence and the Flynn effect

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Highlights

- Temporal variation in innovation rates was most strongly predicted by changes in genotypic IQ
- Illiteracy/homicide was the strongest predictor of the GDP (PPP) per capita/Flynn effect factor
- Innovation rates became sufficient for runaway growth in wealth at the end of the 19th century
- Subsequent declines in Western genotypic IQ have however diminished innovation rates
- Genotypic IQ is defined as the intelligence that people exhibit if they have access to optimal environments

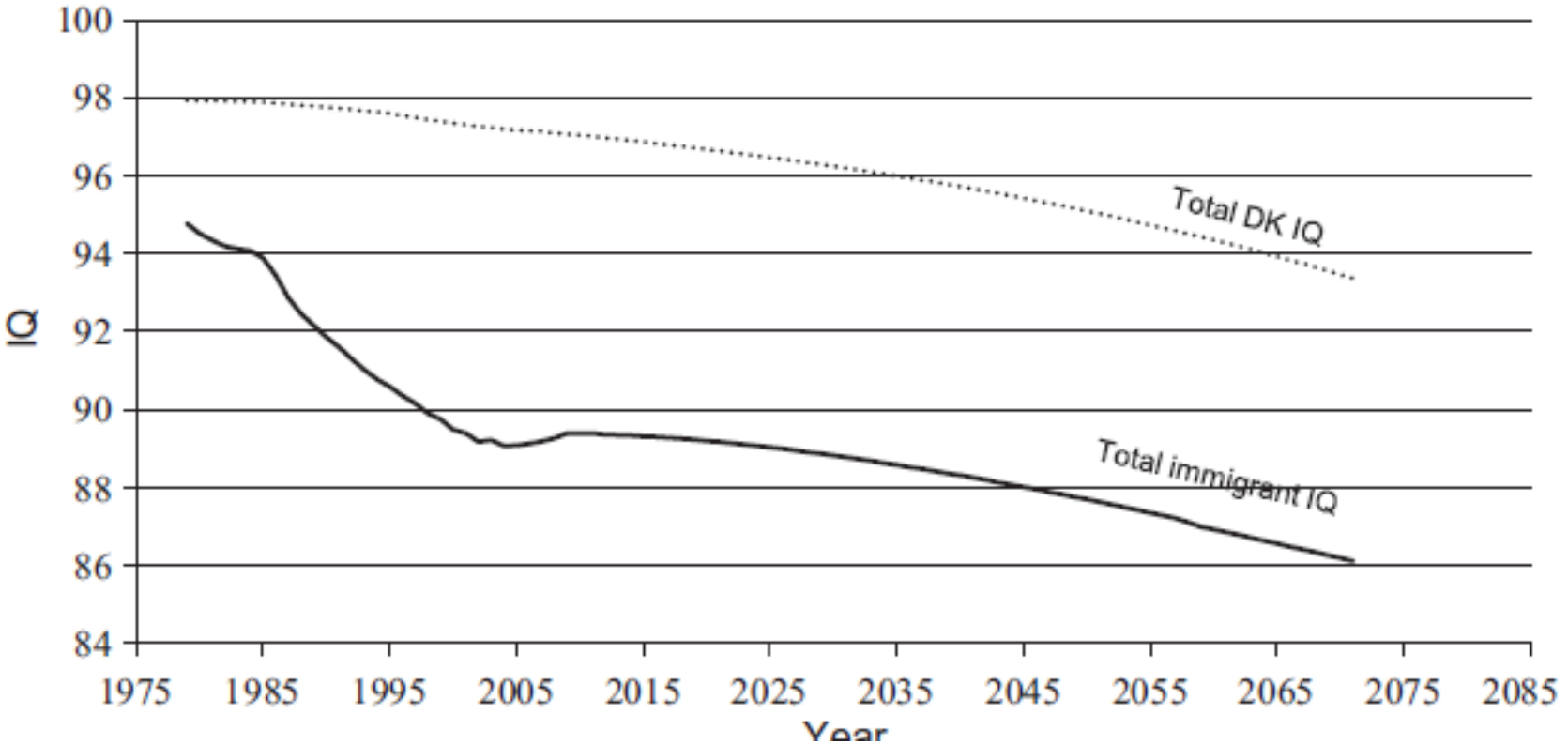
Dysgenesis

- The tendency for a heritable and socially valued trait (such as intelligence) to decline over time within a population as a result of differential fertility disfavouring the trait
- Early in the 20th century, negative correlations were observed between intelligence and fertility
- Early predictions of the rate of dysgenesis were as high as between 1 and 1.5 IQ points per decade
- The opposite happened — IQ increased by around 2.3 points in 15 years (Flynn effect)
- Cohorts reproducing during the ‘baby boom’ years (late 40s and 50s) typically had positive correlations between IQ and completed fertility – this was not the case before and after baby boom

Quantifying IQ Dysgenesis

- Vining (1982): significant negative correlations between fertility and IQ ranging from −.104 to −.221 across categories of sex, age and race
- Estimated genotypic IQ decline of one point a generation
- Vining (1995): 0.5 points per generation
- Retherford and Sewell (1988): 0.81 points per generation assuming 100% heritability
- Ree and Earles (1991): 0.8 points per generation
- Loehlin (1997): 0.8 points per generation
- Lynn (1996), Lynn (2011): Up to 1.7 points per generation

Projection about Danish IQ



Helmuth Nyborg: The decay of Western civilization: Double relaxed Darwinian Selection, Personality and Individual Differences 2012, 53 (2): 118–125

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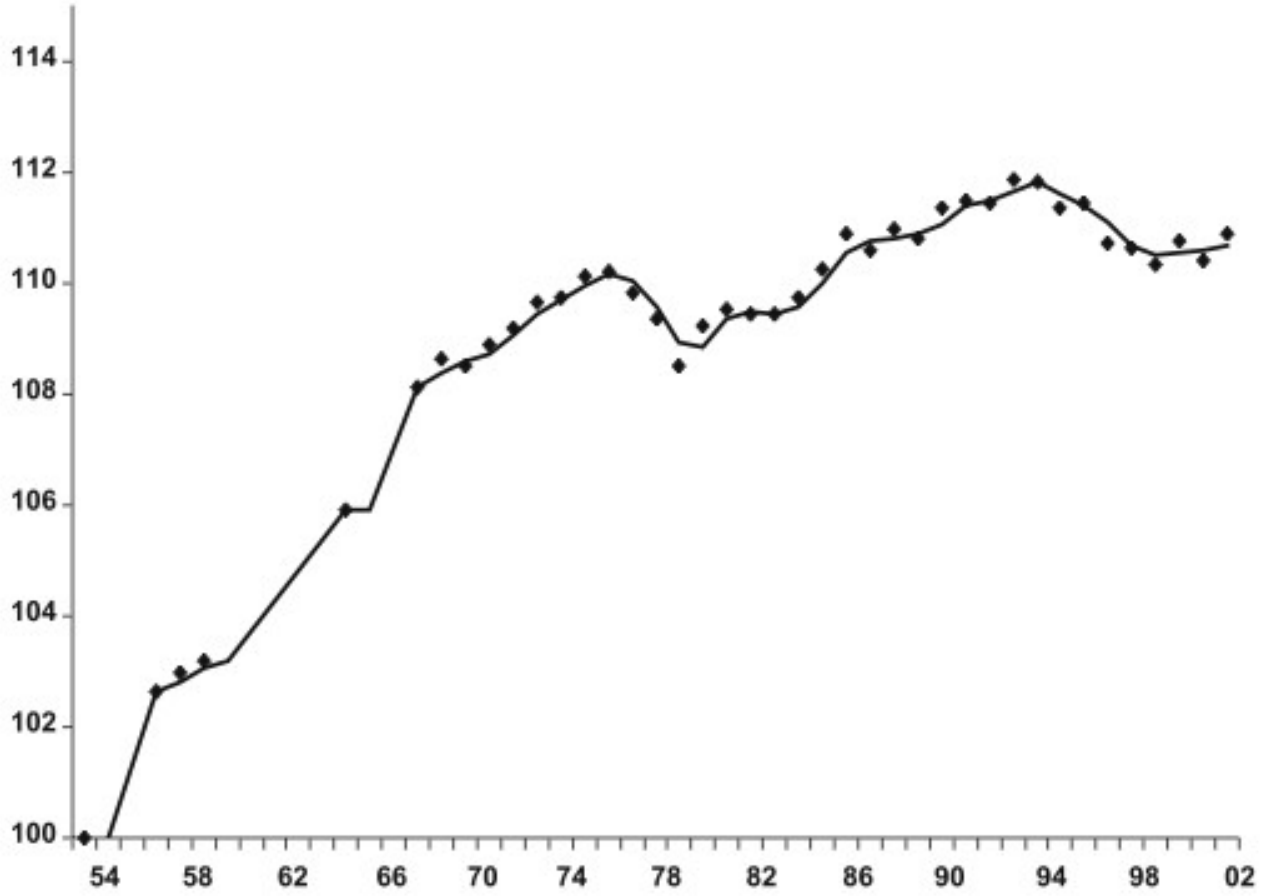
Flynn Effect

- The secular rise of IQ in western countries during most of the 20th century (about 3 points in decade)
- Causes are unknown (but probably nutrition and education or heterosis due to the breakup of inbred communities)
- Has historically completely shadowed dysgenesis
- It is unclear whether *g*-factor is actually increasing or are tests simply losing their *g*-loadedness due to education and rehearsal
- The CD–IE hypothesis – people are choosing slower life history, need more specific abilites
- Dysgenesis is mostly about g, Flynn effect about specific abilities

Flynn effect

- IQ measure for Norwegian conscripts



Sundet, Jon Martin, Dag G. Barlaug, and Tore M. Torjussen. "**The end of the Flynn effect?: A study of secular trends in mean intelligence test scores of Norwegian conscripts during half a century.**" Intelligence 32.4 (2004): 349-362.

Innovation rates

- Huebner (2005): 7198 important events in the history of science and technology, which spans from 1455 to 2004
- A distinction between fundamentally new technologies (what could be termed macroinnovations) and improvements in existing technologies (what could be termed microinnovations)
- Possibly overestimates recent innovations
- Murray (2003): independent estimation of innovation rates from 1400 to 1950
- Correlates highly with Huebner's ($r = .865$, $P < .01$, $N = 50$ decades)
- Uses world population to calculate per-capita innovation rate (but most innovations come from European and Asian people)

Estimating changes in genotypic IQ

- No IQ data exist for populations living between the 15th and the middle of the 19th century
- Hart (2007): a computer model to estimate the change in genotypic IQ amongst various populations over the last 70,000 years as a function of selection
- 1455 European genotypic IQ was about 96.95
- Compatible with the observation that middle class traits (which would have included higher g) were subject to positive directional selection during the Middle Ages up to the 19th century
- Recent dysgenic effect (of genotypic IQ) caused by relaxed selection is extrapolated from 1850-2072

Estimating changes in genotypic IQ

- Upper bound of dysgenesis (with an 1850 genotypic IQ of 109.5)
- Conservative estimates put it around 105
- Skirbekk (2008): An estimation of the feritility of high and low classes in North America (before 1750, 1750-1899, 1900-1924, 1925-1949, 1950-1974, 1975-1989 and 1990-2006)
- Used as an external control of selection potential
- The correlations were > .9 ($P < .01$, $N = 7$ intervals)

Estimating historical changes in Flynn effect rates

- A gain of approximately three points per decade amongst developed countries over the course of the 20th century
- Crepin (2009): Postulates, that IQ was around 50 at Middle Ages, highest gains in 20th century
- Meisenberg, Lawless, Lambert, and Newton (2005): Sigmoidal gain curve, ended around 1980 for Western world
- In current study assumption that IQ rose by 3 points a decade until 2000, at which point it ceased
- People living during the renaissance could realistically had IQs of around 60 relative to people living today
- Hart (2007): The genotypic IQ of people living in the 15th century was probably only a couple of points lower than today

Additional variables

- Three variables were chosen on the basis that
  - they might significantly influence innovation rates and also the Flynn effect
  - data were available spanning from the Middle Ages to the present day
- Homicide rates
  - Eisner (2001): The decline in homicide rates reflects a transition towards greater self-control, which was essential for the process of modernization
- Male literacy rates
  - A more literate population is better able to both disseminate ideas and draw inspiration from the writings of others
- historical estimates of wealth as measured by GDP (PPP) per capita

Correlations and multiple regression

- Data samples were taken at decade points, interpolated from neighboring estimations

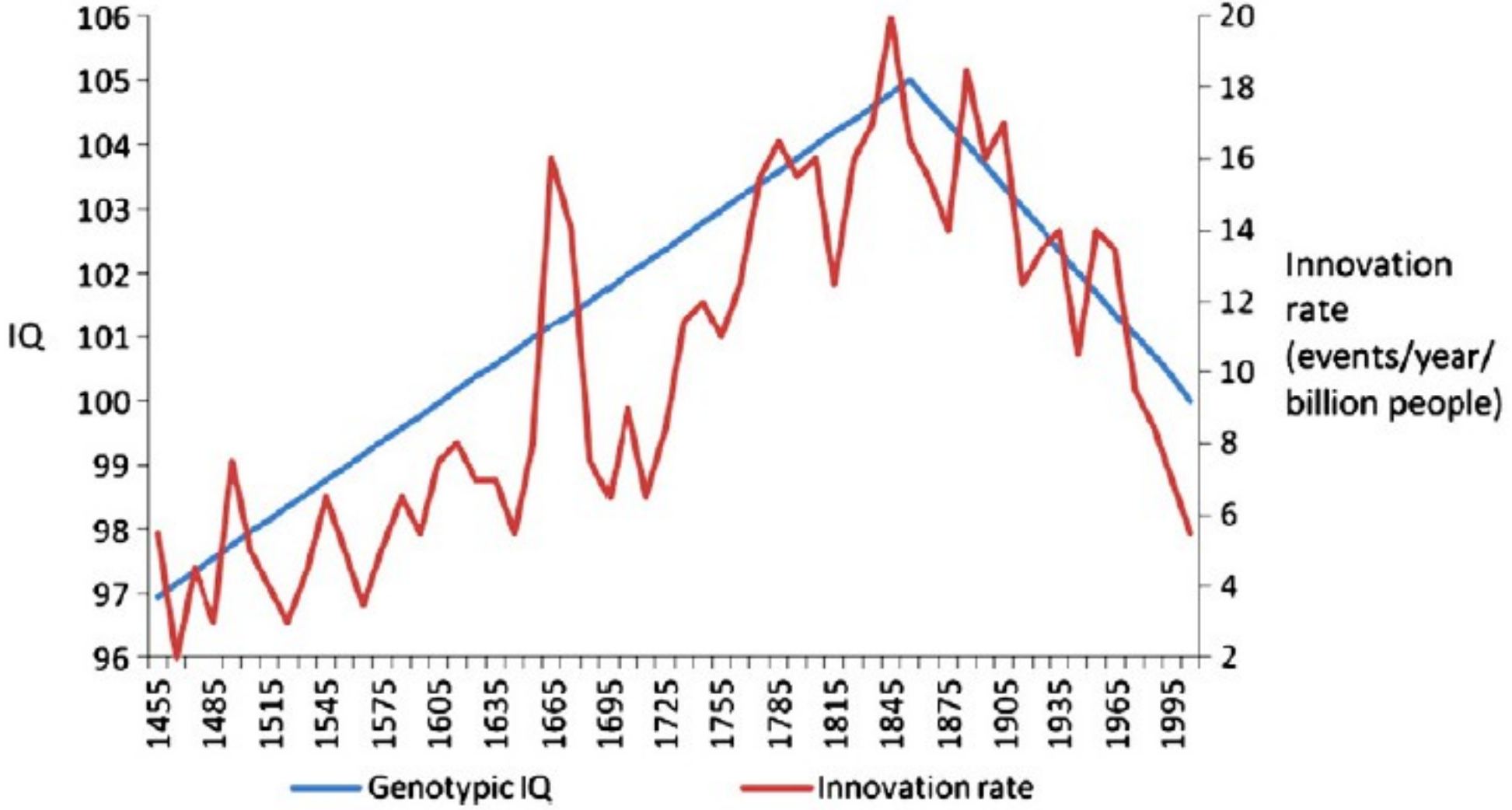
Table 3
Correlation matrix for all variables used ($N = 51$ decades).

	Innovation rates	Genotypic IQ (Nyborg dysgenesis estimates)	Homicide rates	Literacy rates	Genotypic IQ (Meisenberg dysgenesis estimates)	Flynn effect	GDP (PPP) per capita
Innovation rates	1						
Genotypic IQ (Nyborg dysgenesis estimates)	.860**	1					
Homicide rates	−.692**	−.710**	1				
Literacy rates	.633**	.571**	−.944**	1			
Genotypic IQ (Meisenberg dysgenesis estimates)	.875**	.992**	−.780**	.662**	1		
Flynn effect	.183	.030	−.672**	.824**	.144	1	
GDP (PPP) per capita	−.065	−.209	−.448**	.624**	−.099	.930**	1

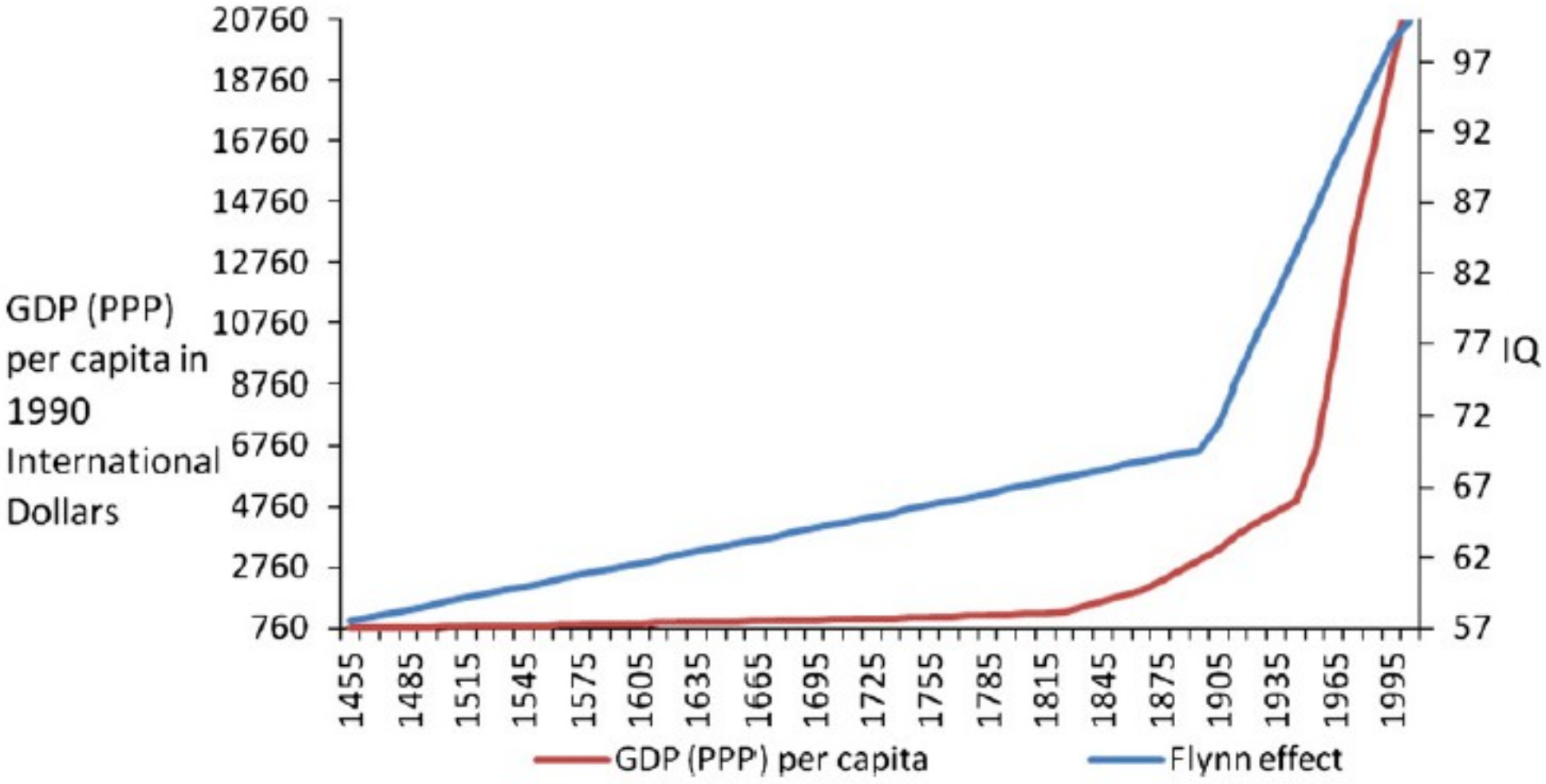
** $P \leq .01$.

- Both genotypic IQ estimates correlate strongly
- Flynn effect correlates with homicide rates and literacy, less with innovation rate

IQ and innovation rate



Flynn effect and GDP



Composite factors

- To avoid the problem of multicollinearity composite factors were created
- Illiteracy + homicide rates
- Historical Flynn effect rate estimates + with GDP (PPP) per capita
- Genotypic IQ was used independently
- All three factors were used to predict the innovation rate

Temporal autocorrelation

- Temporal autocorrelation results from the non-independence of data points due to proximity in time
- This has the potential to significantly inflate the relationships between variables in temporal analysis
- initially the data were broken down and dummy coded based on 90 year periods, and correlation analysis was preformed within each period to determine sign stability

Table 4
The results of analyses in which each variable (genotypic IQ and the homicide + illiteracy common factor) were independently correlated with innovation rates and the Flynn effect + GDP (PPP) per capita common factor respectively within each of the 90 year periods. Due to the small *N* (10) in each case significance levels are omitted.

	1505–1595 (*r*)	1605–1695 (*r*)	1705–1795 (*r*)	1805–1895 (*r*)	1905–1995 (*r*)
Genotypic IQ (Meisenberg estimates) predicting innovation rates	.437	.278	.923	.244	.819
Homicide + illiteracy common factor predicting Flynn effect + GDP (PPP) per capita common factor	-1	-1	-.992	-.974	-.934

Temporal autocorrelation

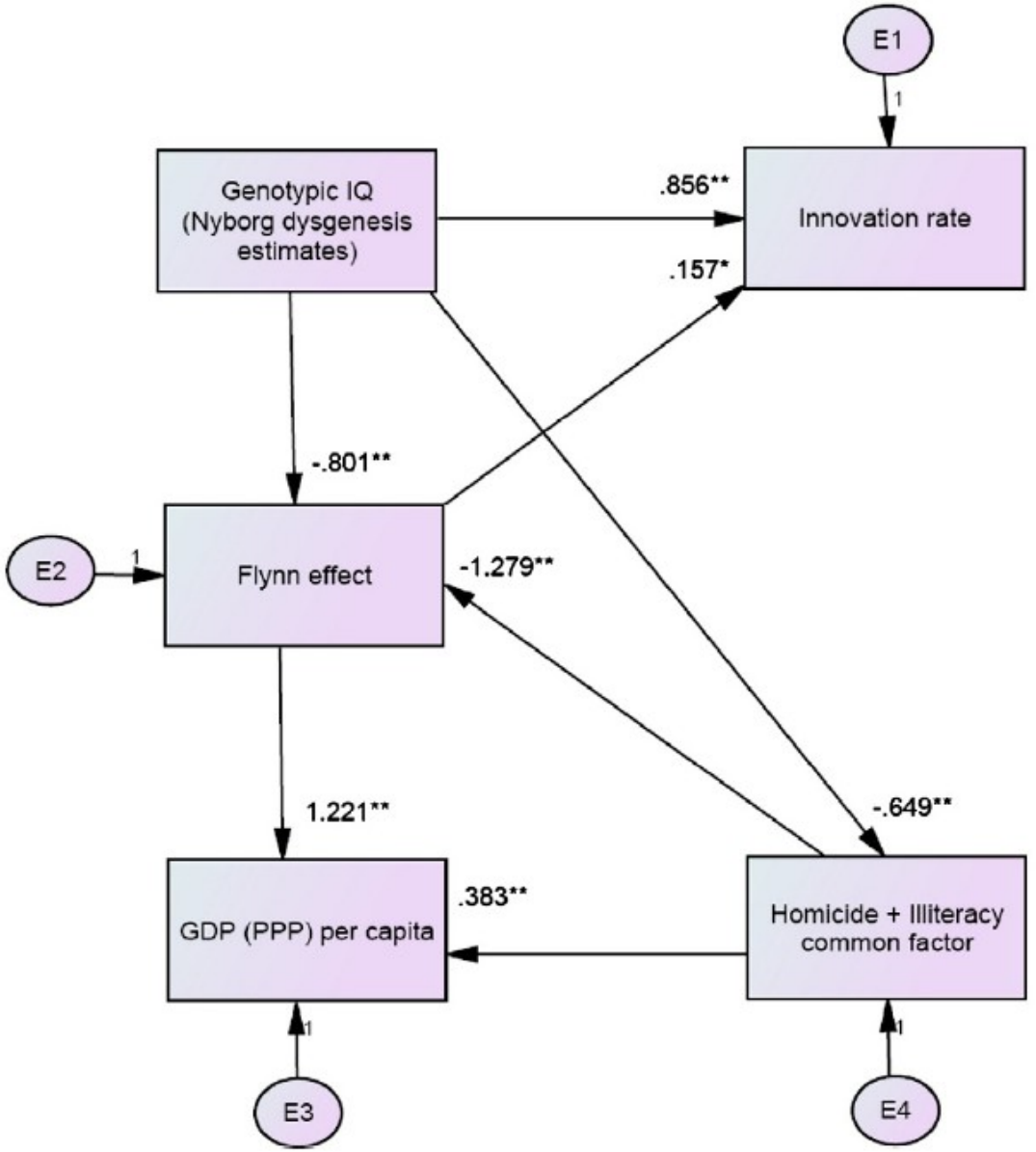
- Dummy coding the periods such that 1505–1595 = 1, 1605–1695 = 2 etc.
- Regressing the genotypic IQ along with this combined time period variable against innovation rates
- Had strong collinearity with homicide rate / literacy common factor
- Eliminating homicide from model did not lower prediction much

Table 6
Prediction of innovation rates with two regression analyses using both estimates of genotypic IQ change, along with two common factors: Flynn effect gains with GDP (PPP) per capita, and literacy with homicide rates. Missing data was handled using list-wise deletion in SPSS ($N = 51$ decades).

Variable	β	β (removal of the literacy/ homicide rate common factor)	Variable	β	β (removal of the literacy/ homicide rate common factor)
Genotypic IQ (Nyborg dysgenesis estimates)	.706**	.873**	Genotypic IQ (Meisenberg dysgenesis estimates)	.787**	.874**
Common factor (Flynn effect + GDP [PPP] per capita)	−.030	.140	Common factor (Flynn effect + GDP [PPP] per capita)	−.039	.040
Common factor (illiteracy and homicide rates)	−.233	–	Common factor (illiteracy and homicide rates)	−.122	–
Model fit (adjusted R^2)	.75	.75	Model fit (adjusted R^2)	.75	.76

** $P < .01$

Path analysis



Path analysis

- Inferred from regression analysis, used to find causality
- High genotypic IQ promotes innovation and decreases homicide/illiteracy
- Negative predictor of the Flynn effect
- The Flynn effect significantly promotes wealth, and is in turn promoted by the common factor of homicide and illiteracy
- This common factor is also a significant independent predictor of wealth
- The Flynn effect is also a positive predictor of innovation rates

Science in decline

- Genotypic IQ is the strongest predictor of changes in the rates of scientific and technological innovation
- A 5-9 point decline in the Western genotypic IQ mean would have decreased the proportion of the population with the sort of IQ needed for significant innovation (i.e. ≥ 135) by ~55–75% percent
- The worldwide increase in the rate of innovation from 1455 to 1873 followed by a sharp decline is consistent with continued dysgenesis and also with the existence of a “eugenic phase” in the population cycle
- in some areas of research, discovery might be hitting physical limits as the “low hanging fruit” have mostly all been “picked”

Wealth in ascent

- Flynn efect seems to be strongly parallel to the growth of GDP
- The common factor of these two variables is well predicted by growing literacy and decreasing homicide rates
- It is consistent with slowing life-history models
- Higher-K individuals are less impulsive
- Up to 19 century selection was the main mechanism that slowed the life-history
- The weak association of GDP and innovation rate suggests, that the recent growth is not dependent on increased rate of innovation
- This is consistent with the view that Flynn effect further slows life-history (innovation are high-risk)

Conclusions

- In Western nations Genotypic intelligence has been in decline since at least 1850
- Decrease in IQ has not affected the wealth (yet?)
  - Good news for people outside Europe/East Asia with lower genotypic IQ but an untapped potential for Flynn effect
  - The singularity (of wealth) has already happened
- It seems to afect the innovation rate
  - Junk science taking over as the ratio of intelligent individuals is increasing?
- Historical precedent – the collapse of Roman Empire?
  - Plummeting innovation rate and loss of innovations
- The technological singularity is unlikely to happen