



Risk-Based Student Loans

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10:40-12:10PM

Risk-based student loans

- Policy goals of the federal student loan program
- Human capital theory and the economic value of education
- Some degrees have higher economic value than others
- Market failures in higher education and skills mismatch in the labor market
- Risk-based pricing as a solution

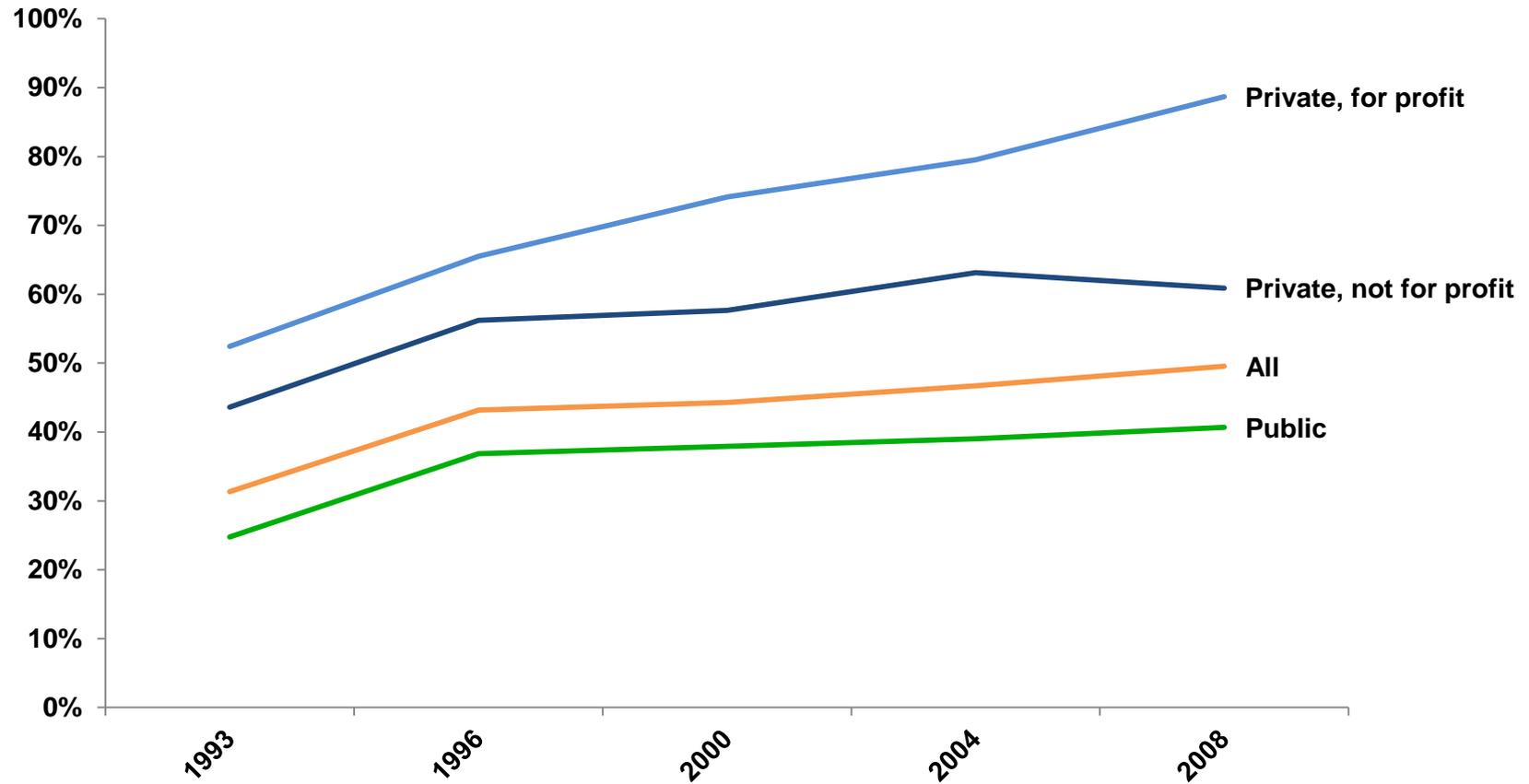
NDEA and HEA created student loans to serve economic policy goals

- Develop a skilled labor force to serve the needs of business and government
- Promote equality of opportunity and individual economic advancement
- Promote technological development and economic growth
- Note: Similar goals have been expressed in other Federal legislation supporting higher education:
 - Morrill Act (1862, Land Grants) required “mechanical and agricultural arts” be taught
 - National Defense Education Act of 1958 focused on STEM
 - Higher Education Act of 1965 (NDEA, plus emphasis on social mobility)

Federal student loans are an increasingly important source of education financing

Full-time, full-year undergraduates receiving federal student loans, 1993-2008

Percent of undergraduates, by type of institution



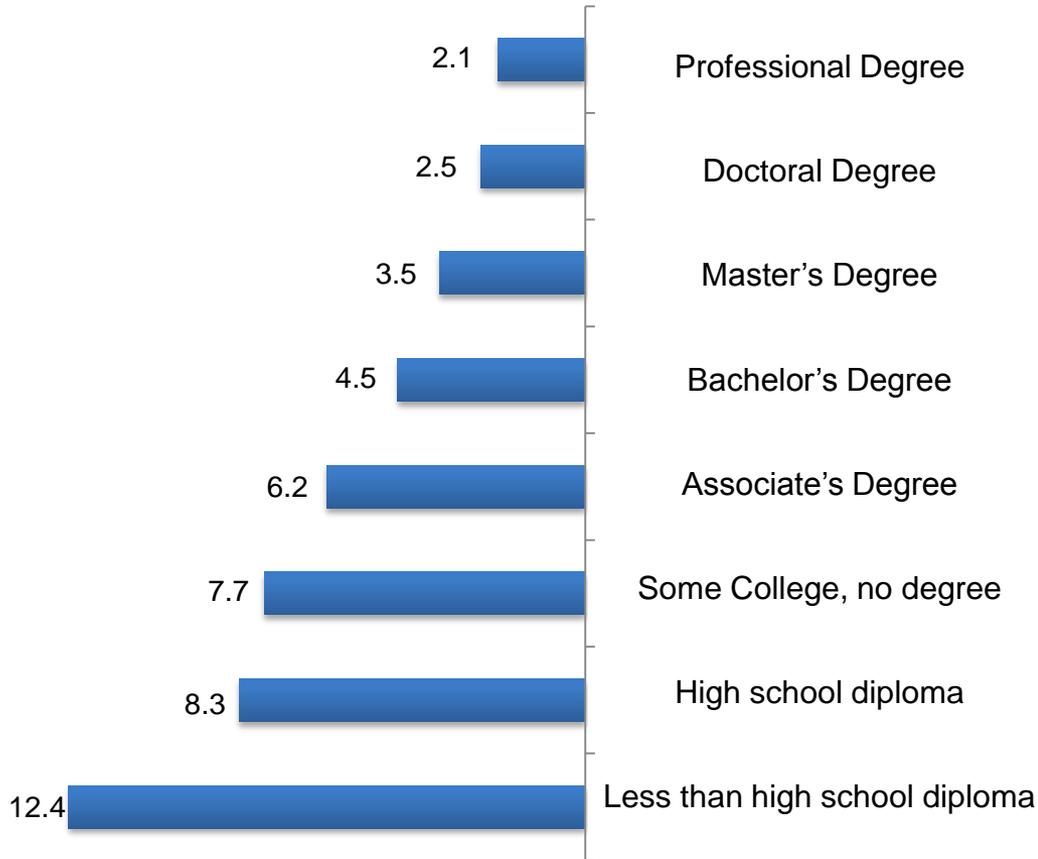
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Educated workers earn more and are unemployed less

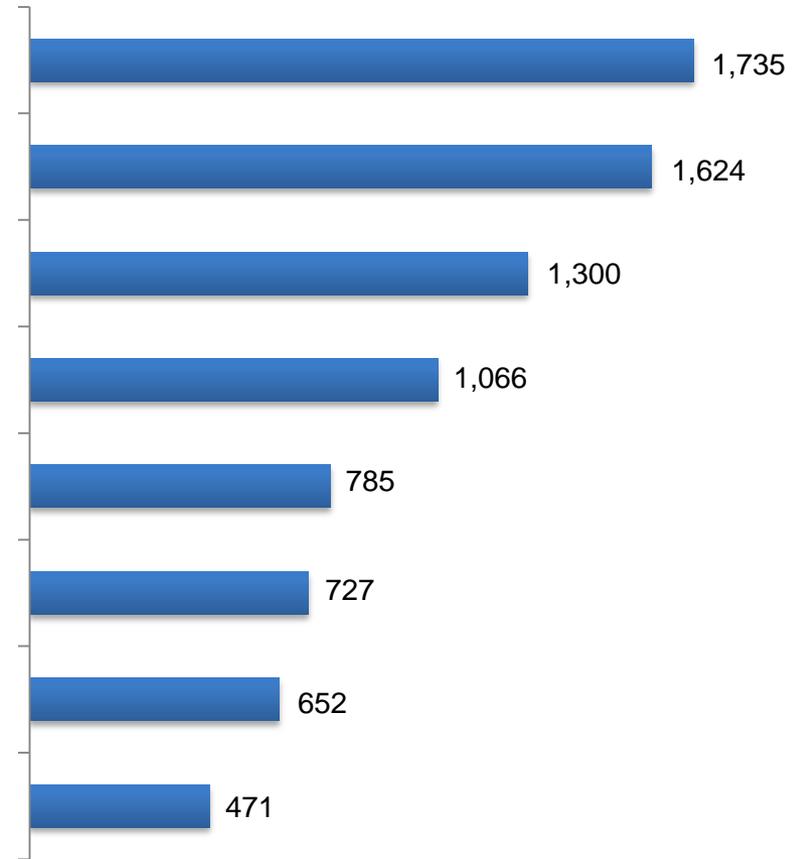
Educational attainment and unemployment, 2012

Percent unemployed



Educational attainment and median weekly earnings

2012 USD

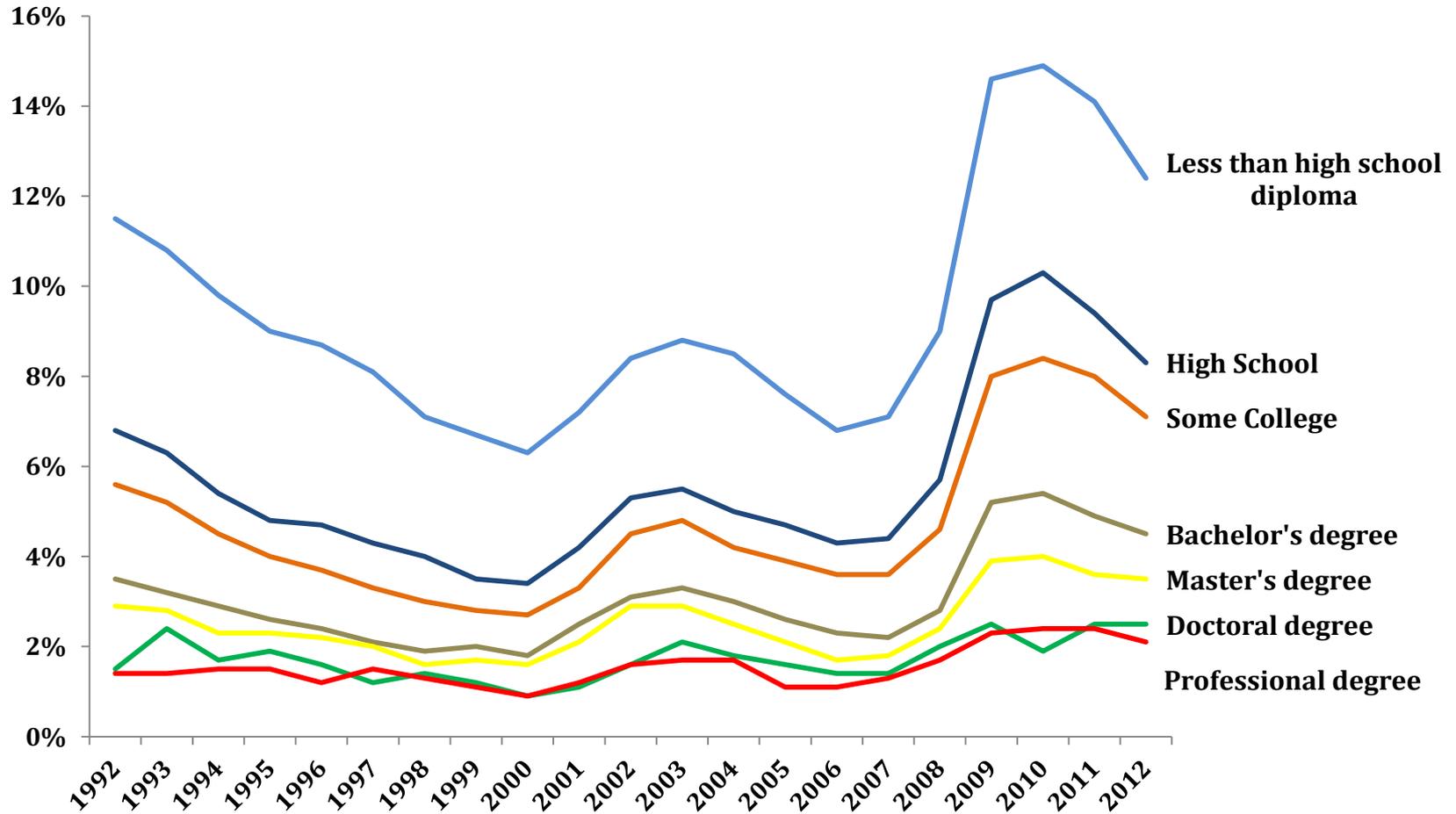


Note: Workers age 25 and older only

Source: Bureau of Labor Statistics, U.S. Department of Labor and U.S. Census Bureau, Current Population Survey

Decades of data show that educated workers are less likely to be unemployed

Average annual unemployment rates, age 25 or older, 1992-2012
Percent of workers age 25 or older who were unemployed

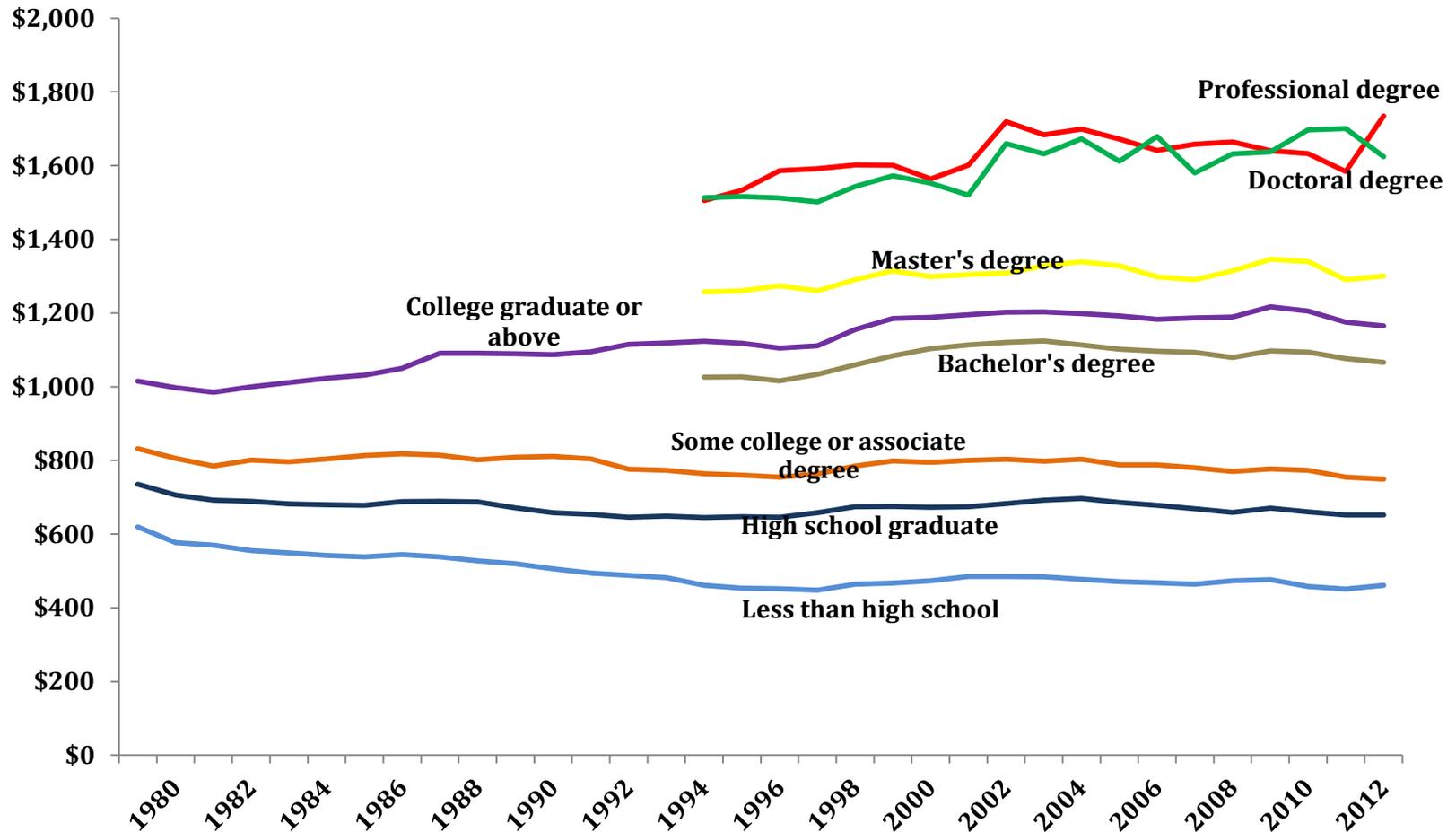


Source: Bureau of Labor Statistics, U.S. Department of Labor and U.S. Census Bureau, Current Population Survey, Labor Force Statistics

Decades of data show that educated workers earn more, and the wage premium has increased over the last 30 years

Median usual weekly earnings of full-time workers 25 years and over by educational attainment, 1979-2012

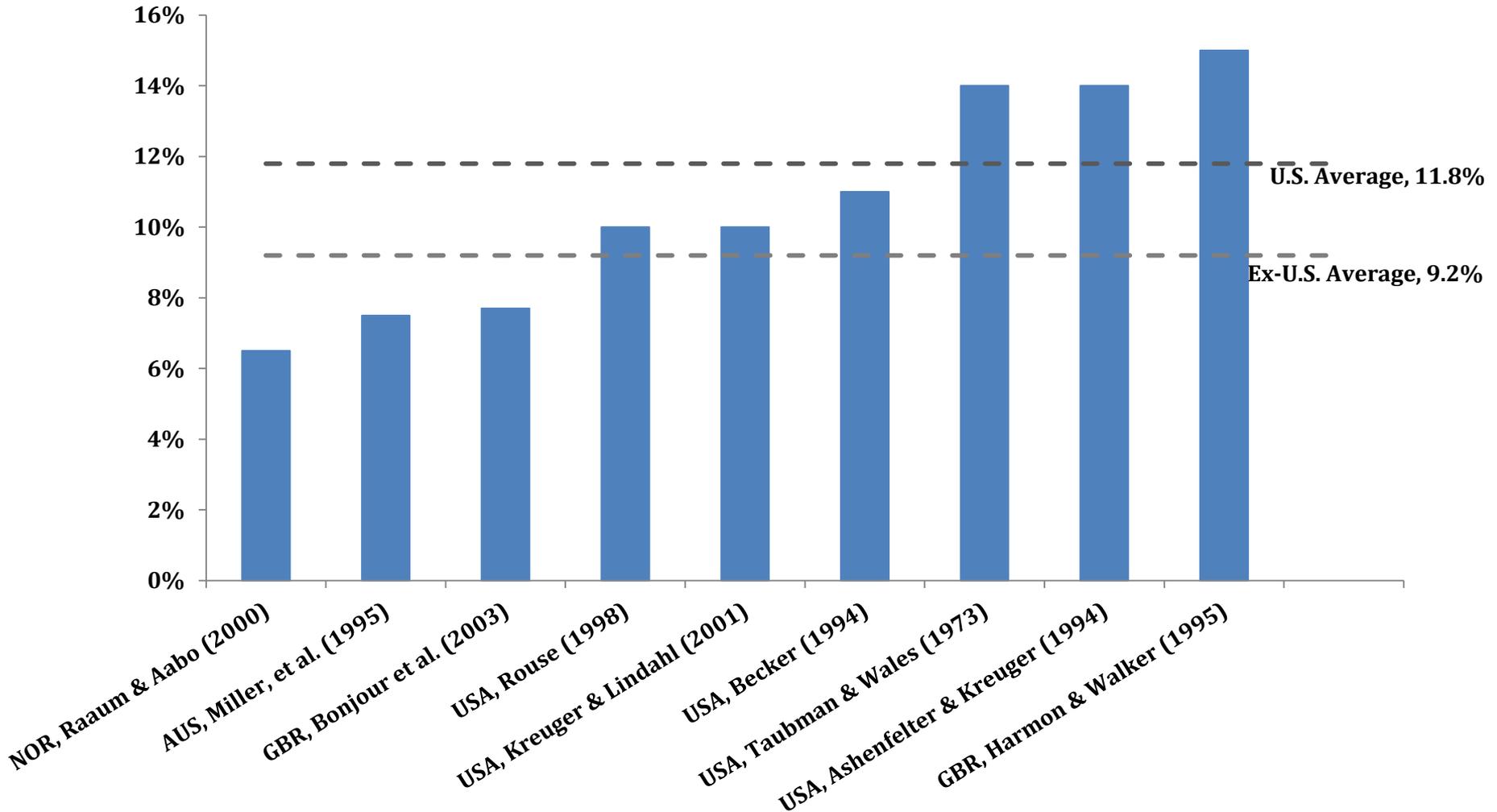
Real 2012 USD



Source: Current Population Survey, Bureau of Labor Statistics

Education boosts wages after controlling for student ability

Economists' estimates of increase in wages caused by one year of schooling
Percent increase in lifetime wages from an additional year of school, midpoint estimate



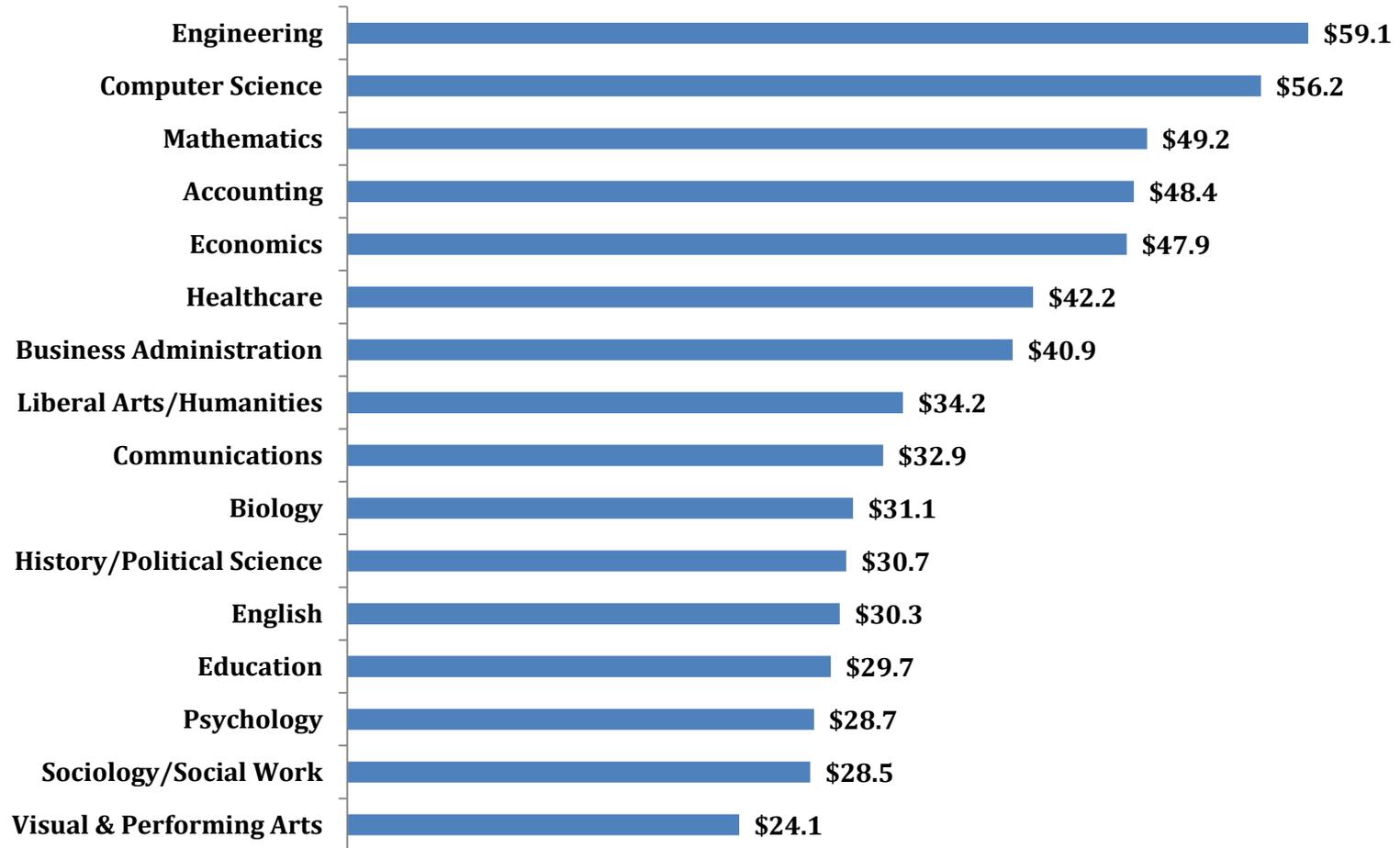
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Some academic majors have a higher initial labor market value than others

Recent graduates' median starting salary offer by major, 2011

2011 USD thousands



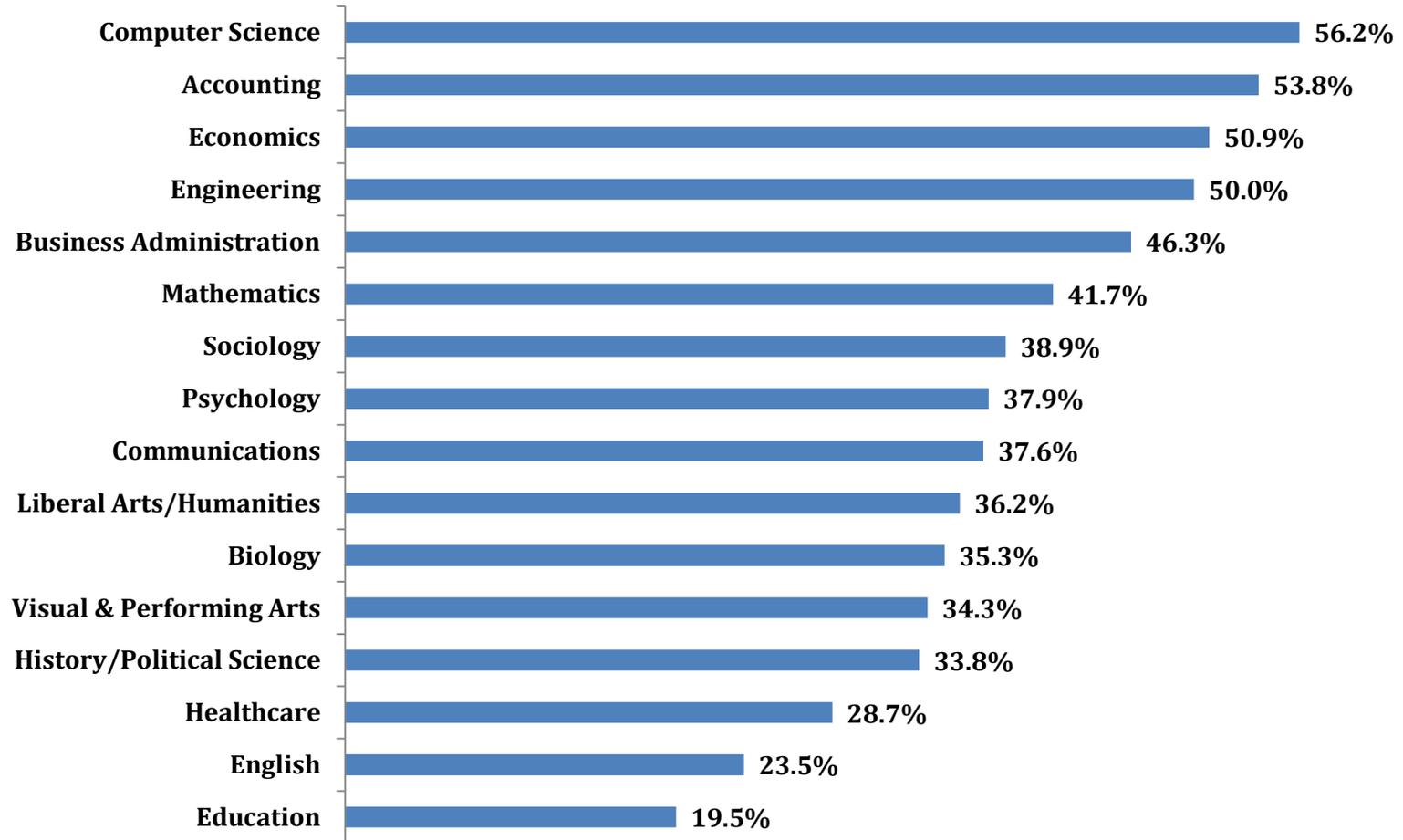
Source: National Association of Colleges and Employers, The Class of 2011 Student Survey Report 36 Figure 30

Note: Bachelor's degree recipients only

Some academic majors are more likely to lead to employment at graduation than others

Job offer rate by major, 2011

Percent of recent graduates with job offers at graduation



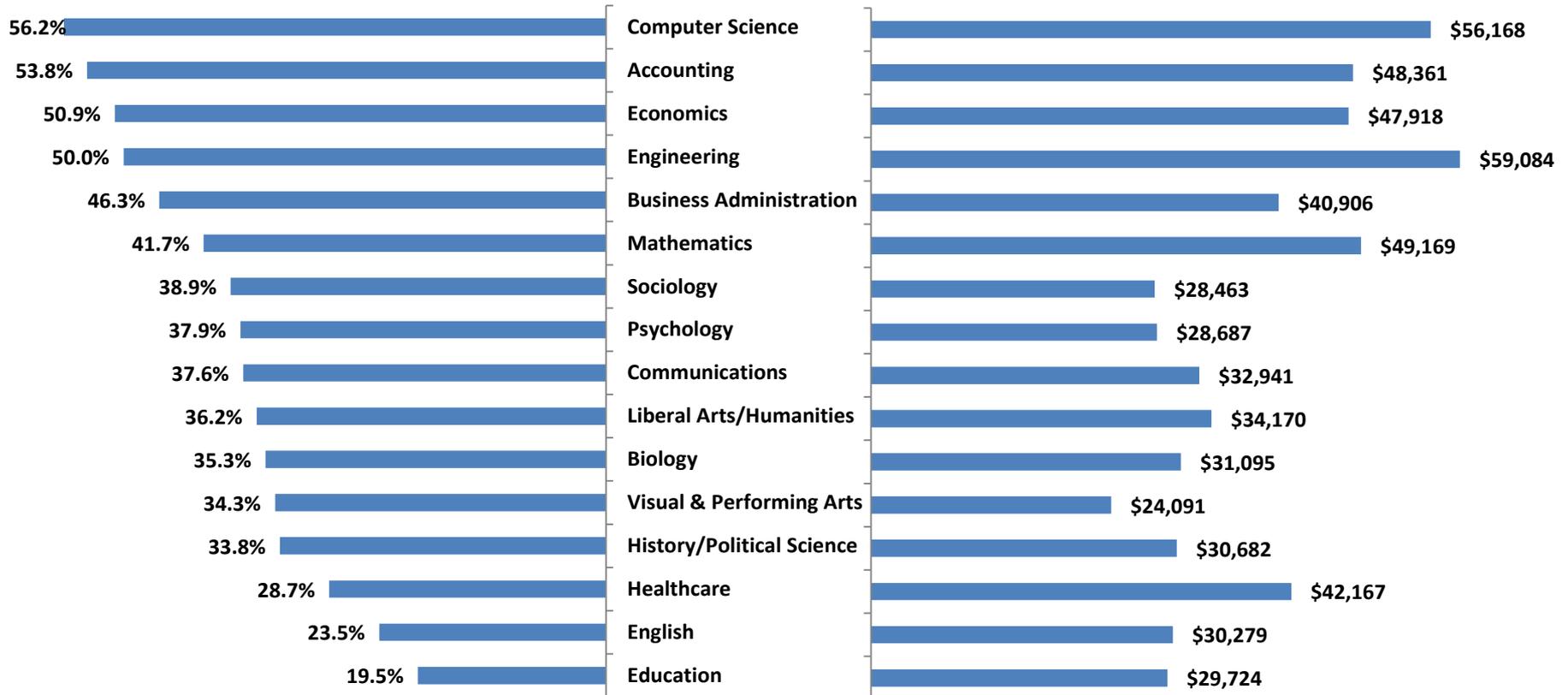
Some academic majors have a higher labor market value than others

Job offer rate by major, 2011

Percent of recent graduates with job offers at graduation

Recent graduates' median starting salary offer by major, 2011

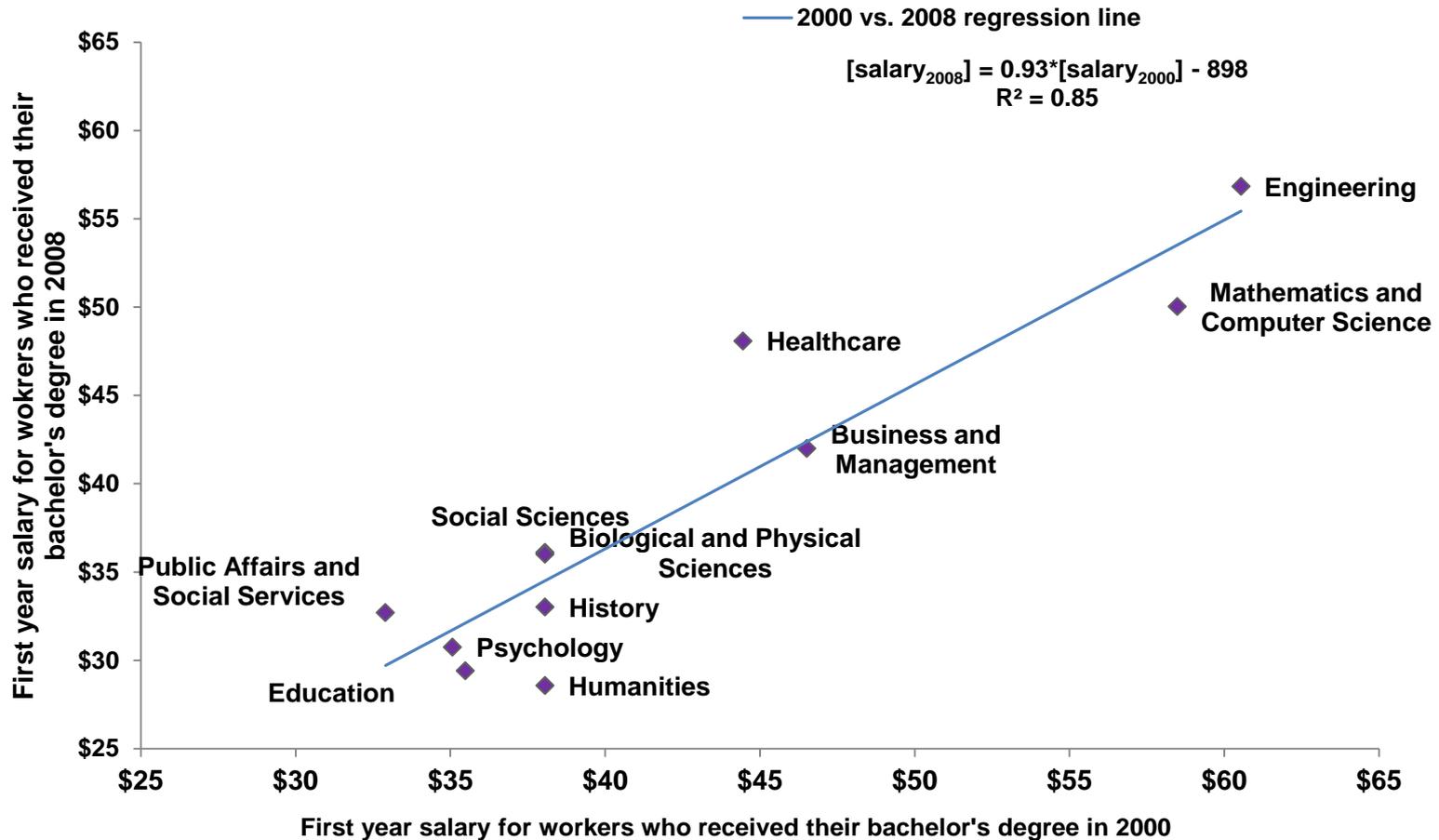
2011 USD



Past starting salary for graduates with a certain major is a reasonably good predictor of future starting salaries by major

Median salary one year after graduation by major for 2000 and 2008 graduates

2011 USD Thousands

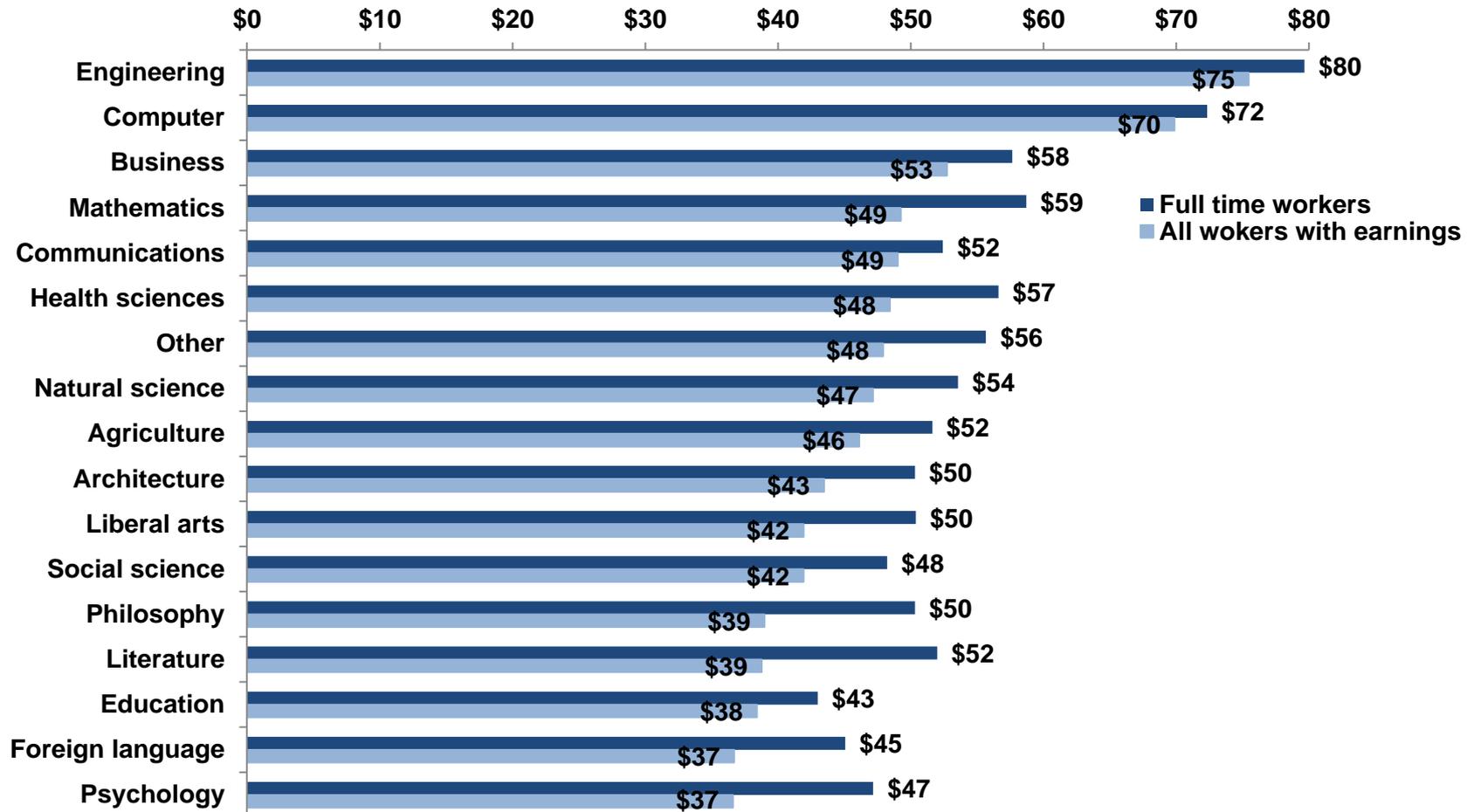


Source: National Center for Education Statistics, Digest of Education Statistics 2011, Table 404

Note: Bachelor's degree recipients only

Over the long term, college graduates in some fields earn more and are more likely to work full time

Annualized median earnings by bachelor degree field, 2009
Population age 18 and over where highest degree is bachelor's
2011 USD thousands



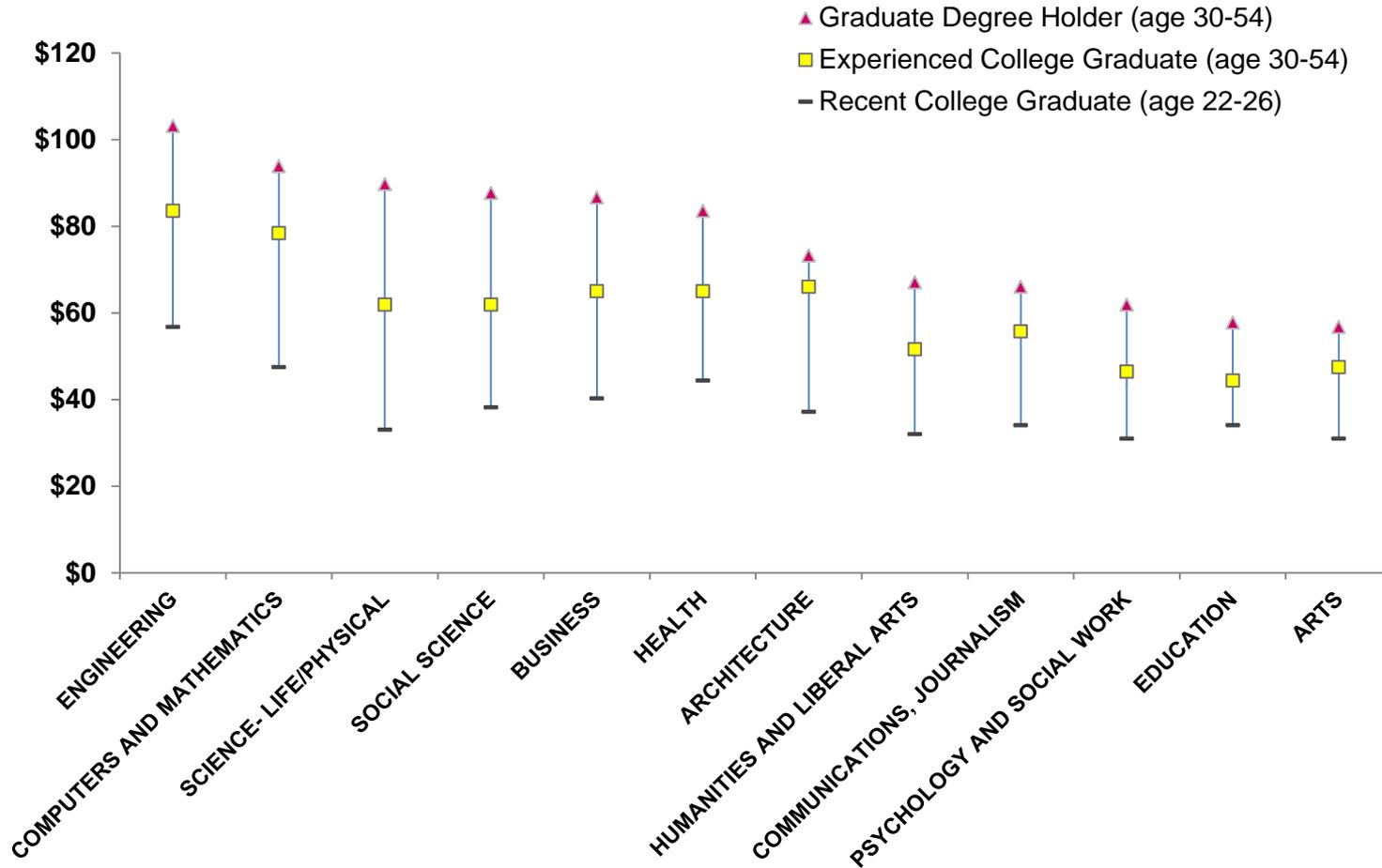
Source: US Census Bureau, Survey of Income and Program Participation, 2008 Panel, Table 4G.

Note: Bachelor's degree recipients only; annualized earnings calculated by multiplying monthly earnings by 12

Some majors may provide better opportunities to boost earnings with additional work experience or graduate education

Median earnings by college major, age, and education attainment 2009-2010

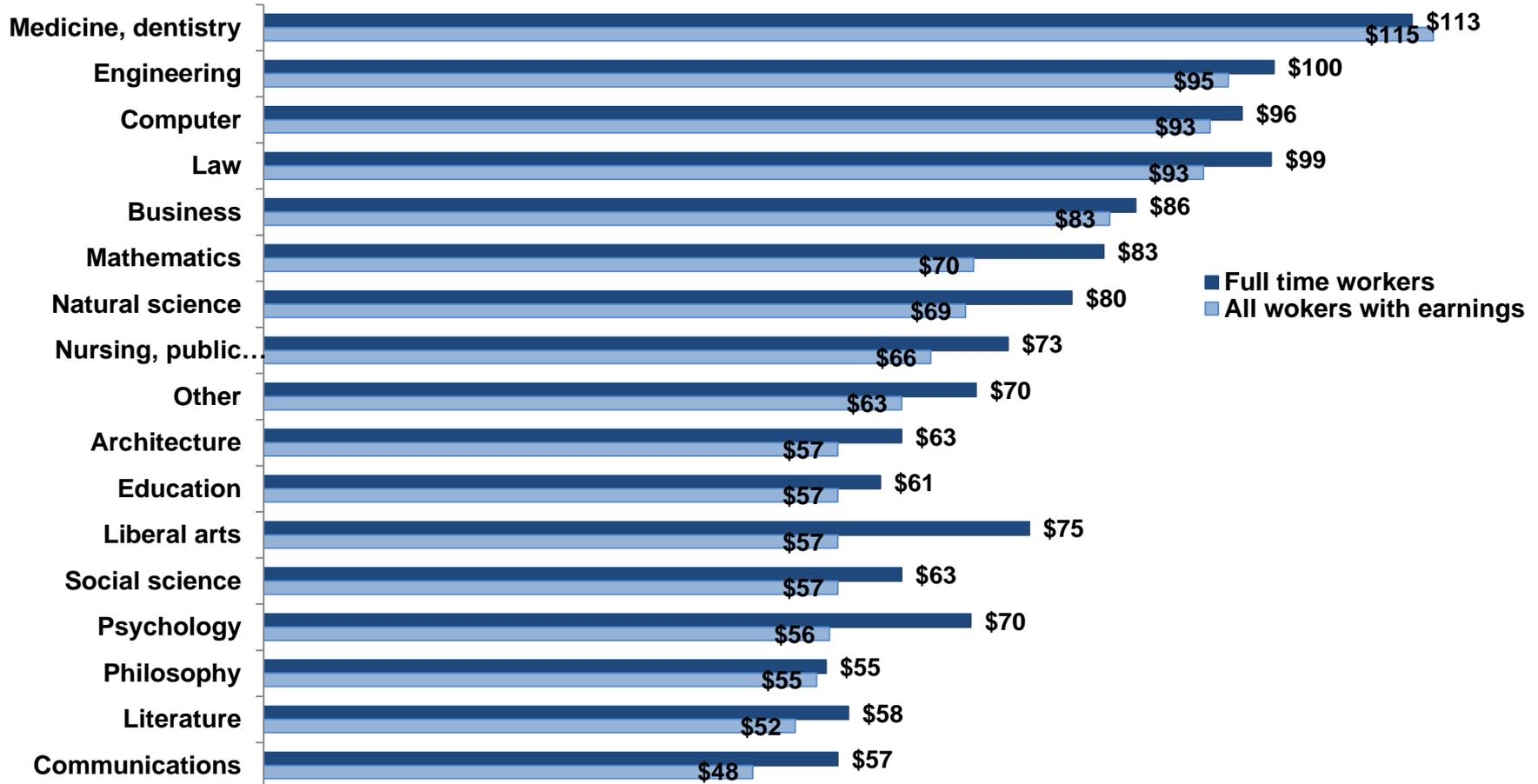
Real 2011 USD thousands



Source: U.S. Census Bureau, American Community Survey 2009 & 2010; Anthony P. Carnevale, Ban Cheah, & Jeff Strohl, Georgetown University Center on Education and the Workforce, *Hard Times, College Majors, Unemployment, and Earnings: Not All College Degrees Are Created Equal* (Jan. 2012).

The most valuable graduate degree fields are medicine, computers, engineering, law, and business

Annualized median earnings by advanced degree field, 2009
 Population age 18 and over where highest degree is an advanced degree
 2011 USD thousands



Source: US Census Bureau, Survey of Income and Program Participation, 2008 Panel, Table 4H.
 Note: Annualized earnings calculated by multiplying monthly earnings by 12.

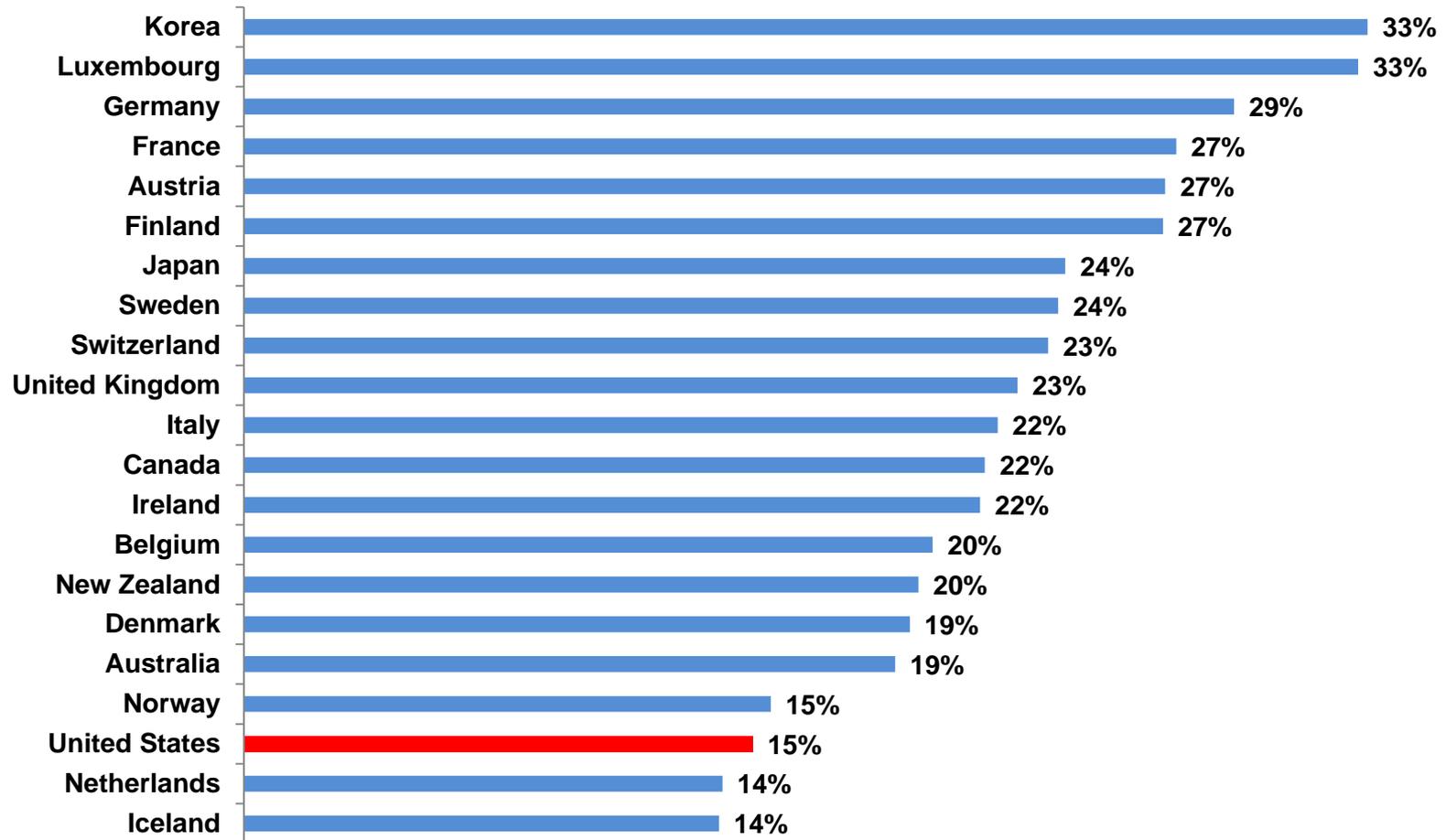
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In spite of high wages and strong employment prospects, the U.S. produces relatively few STEM degrees

STEM college degrees as percent of total by country, 2008

Percent of total college graduates

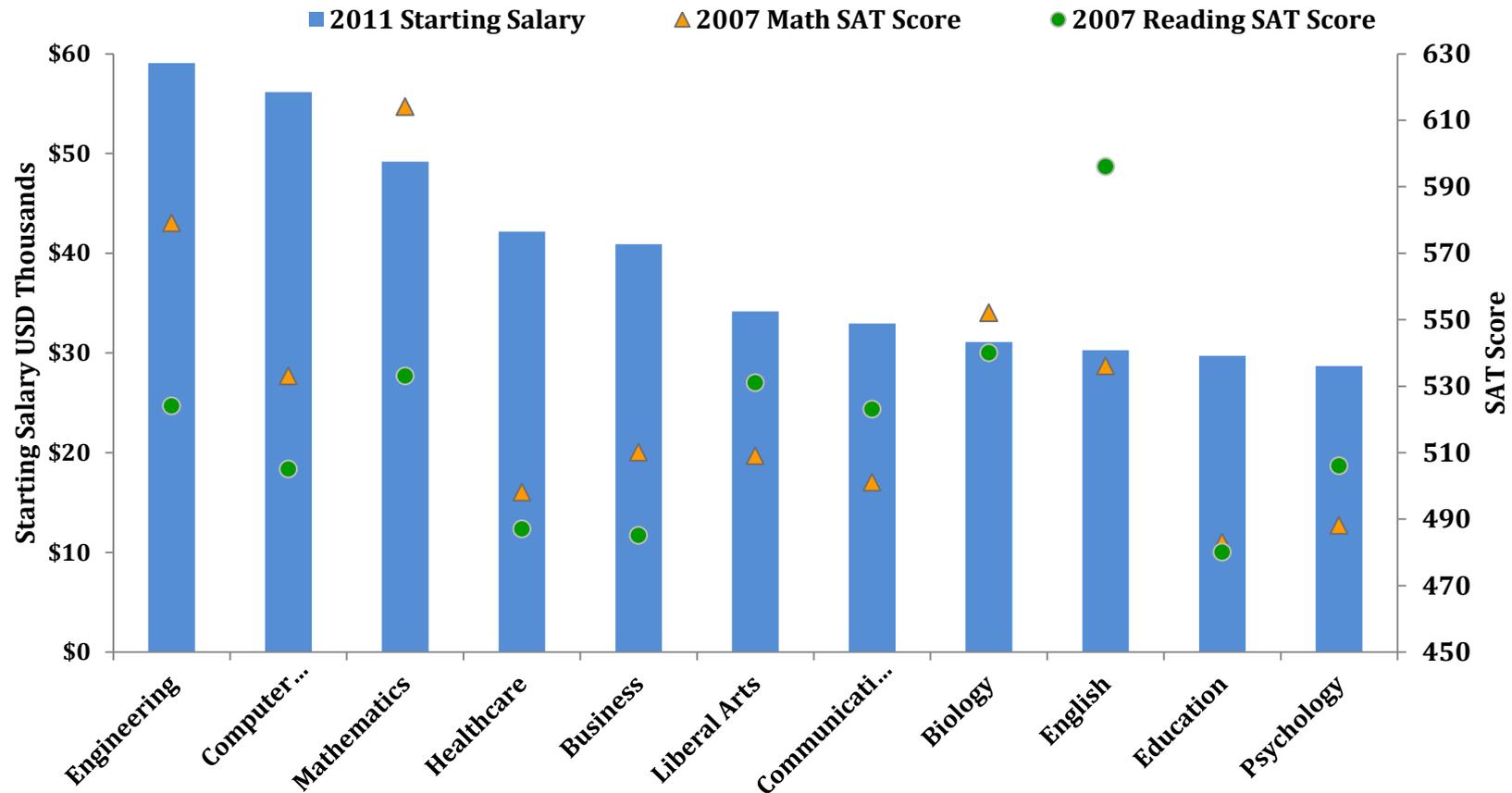


Differences in earnings by major do not appear to be due solely to differences in student ability

2011 median starting salary offer and 2007 mean SAT score by college major

Real 2011 USD thousands

SAT Score

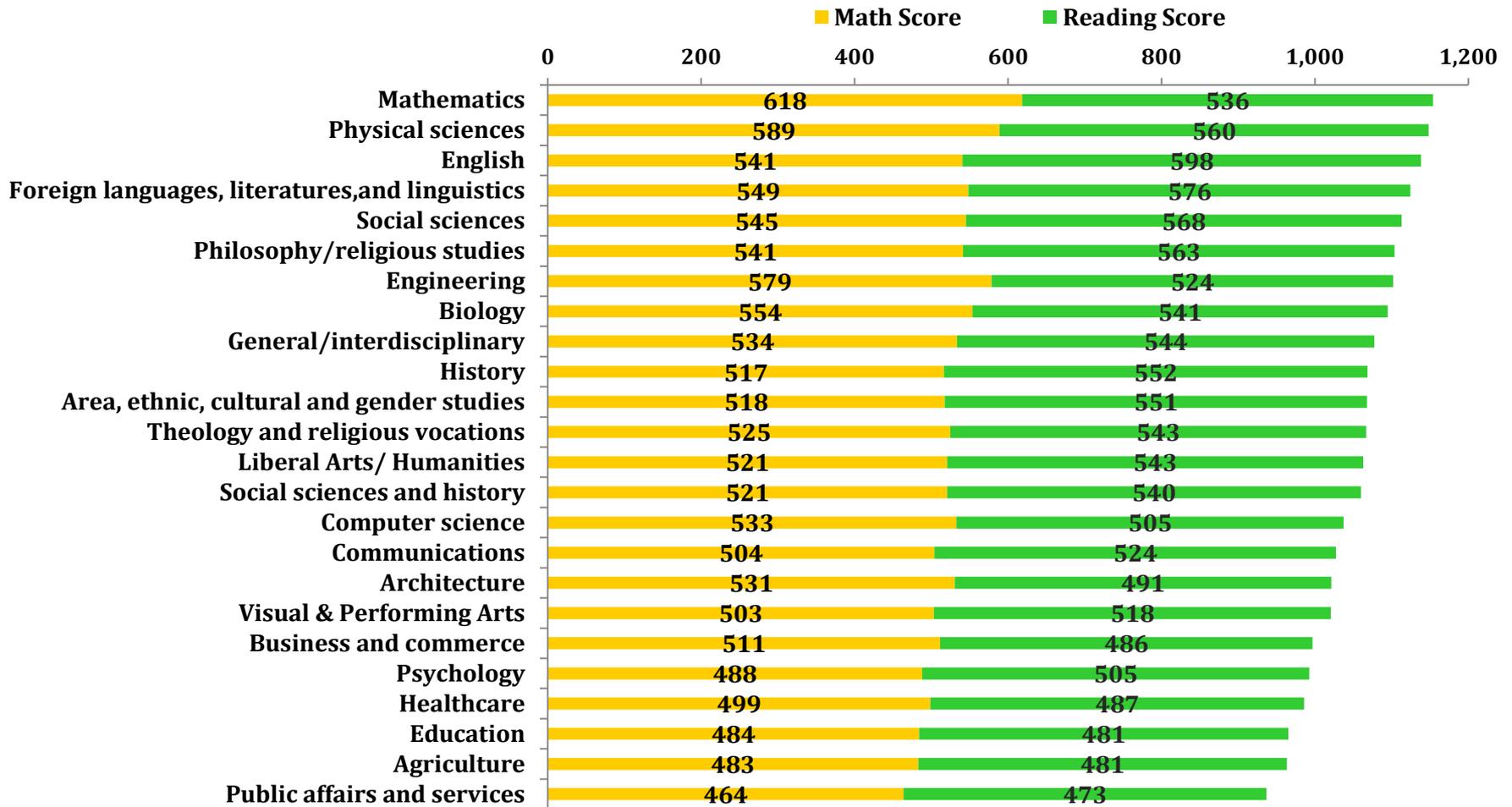


Source: Digest of Education Statistics, 2006-2011; College Entrance Examination Board, *College-Bound Seniors: Total Group Profile [National] Report*; National Association of Colleges and Employers, *The Class of 2011 Student Survey Report 36 Figure 30*

Note: Differences in SAT scores may be underestimated because SAT scores are for intended majors and salaries are for completed majors. There is some evidence that lower ability students switch from challenging majors such as Engineering and Computer Science into less challenging majors such as Business, English, and other social science and humanities fields.

Differences in earnings by major do not appear to be due solely to differences in student ability

Average SAT scores of high school seniors by intended college major, 2005-2008

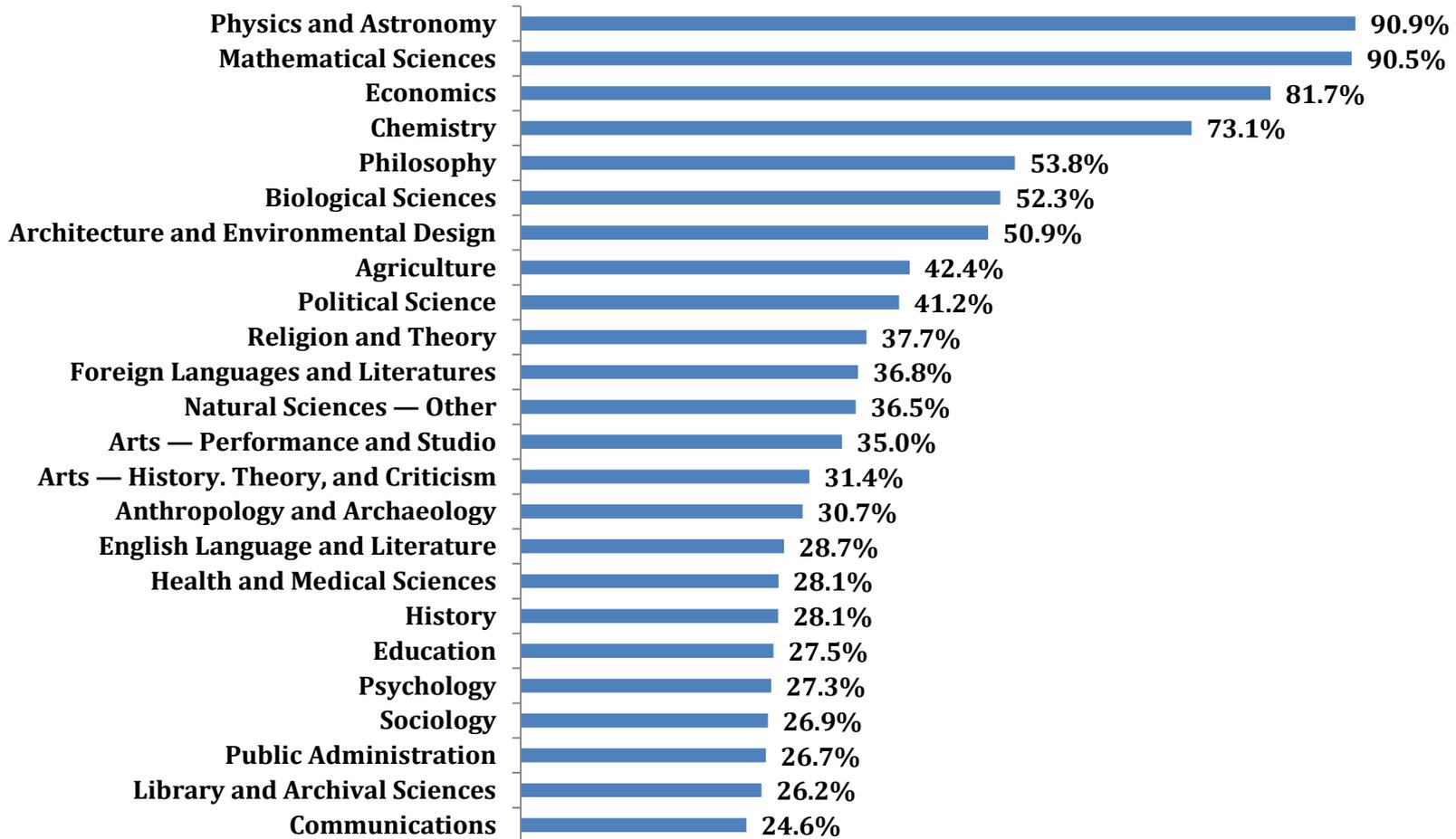


Source: Digest of Education Statistics, 2006-2011; College Entrance Examination Board, *College-Bound Seniors: Total Group Profile [National] Report*

Many students who currently choose lower value fields have the ability to succeed in business

Percent of GRE test takers who have quantitative GRE scores that are above the average scores of students who intend to study business in graduate school, by intended graduate major, Aug. 2011 - Apr. 2012

Percent of students with high quantitative GRE scores



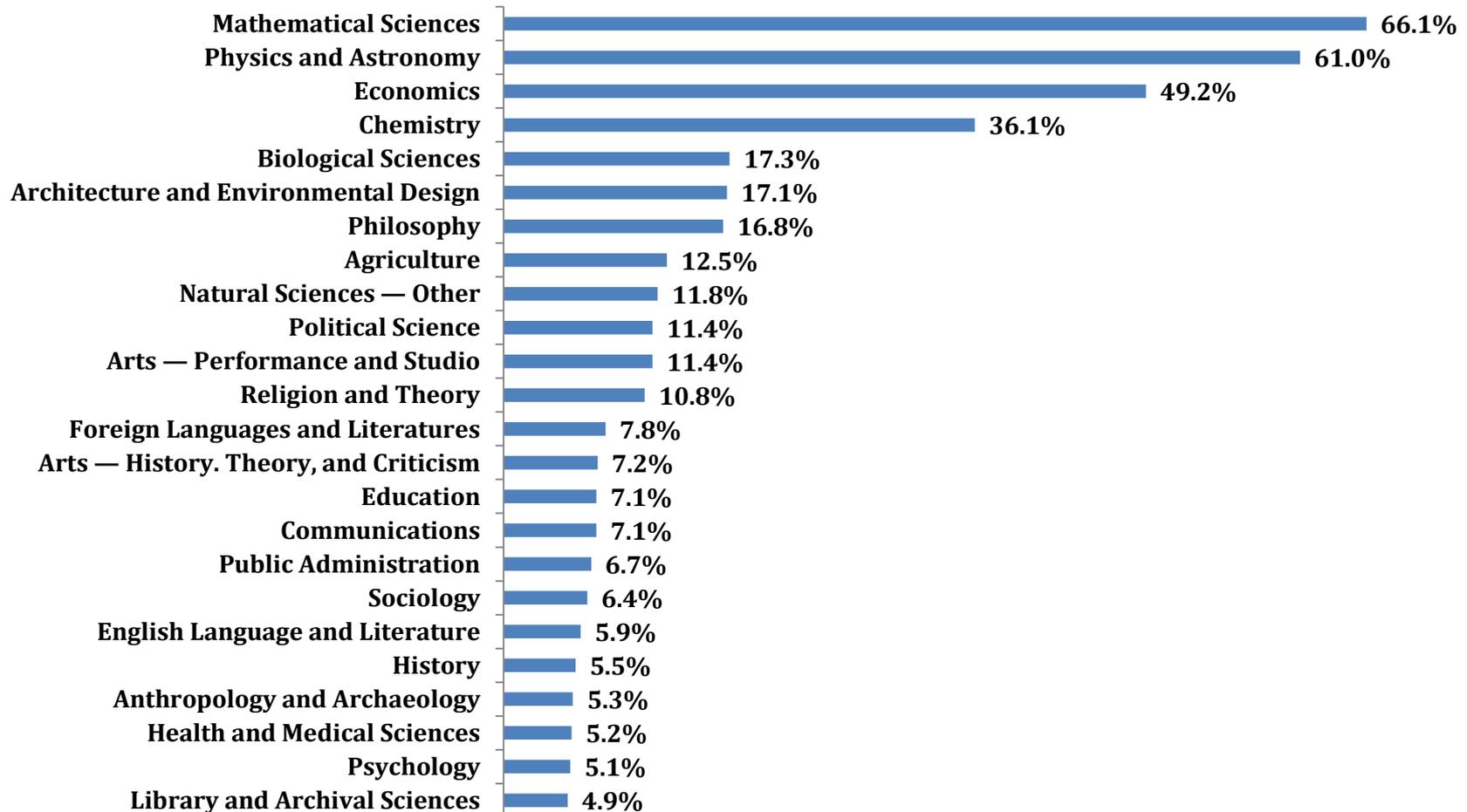
Note: Most graduate business students take the GMAT rather than the GRE. Those taking the GRE may intend to pursue a Ph.D. in business rather than an MBA.

Source: Educational Testing Service, GRE Guide to the Use of Scores (2012), Table 4

Many students who currently choose lower value fields have the ability to succeed in engineering

Percent of GRE test takers who have quantitative GRE scores that are above the average scores of students who intend to study engineering in graduate school, by intended graduate major, Aug. 2011 - Apr. 2012

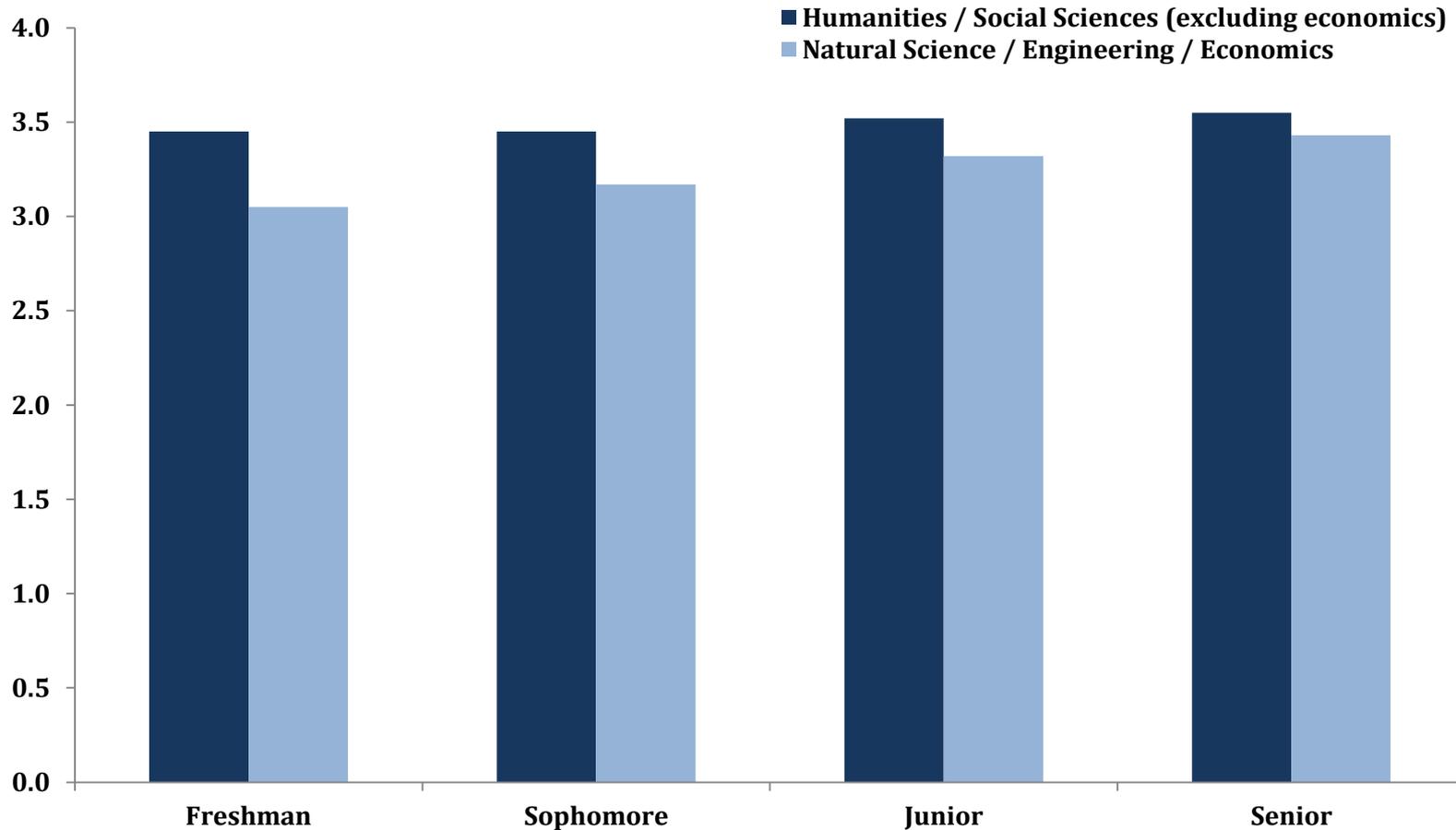
Percent of students with high quantitative GRE scores



Students who take courses in high value fields receive lower grades, especially in the early years of college when they select a major

Grades by course type and school year for a sample of Duke undergraduates

Non-cumulative within-year grade point average,

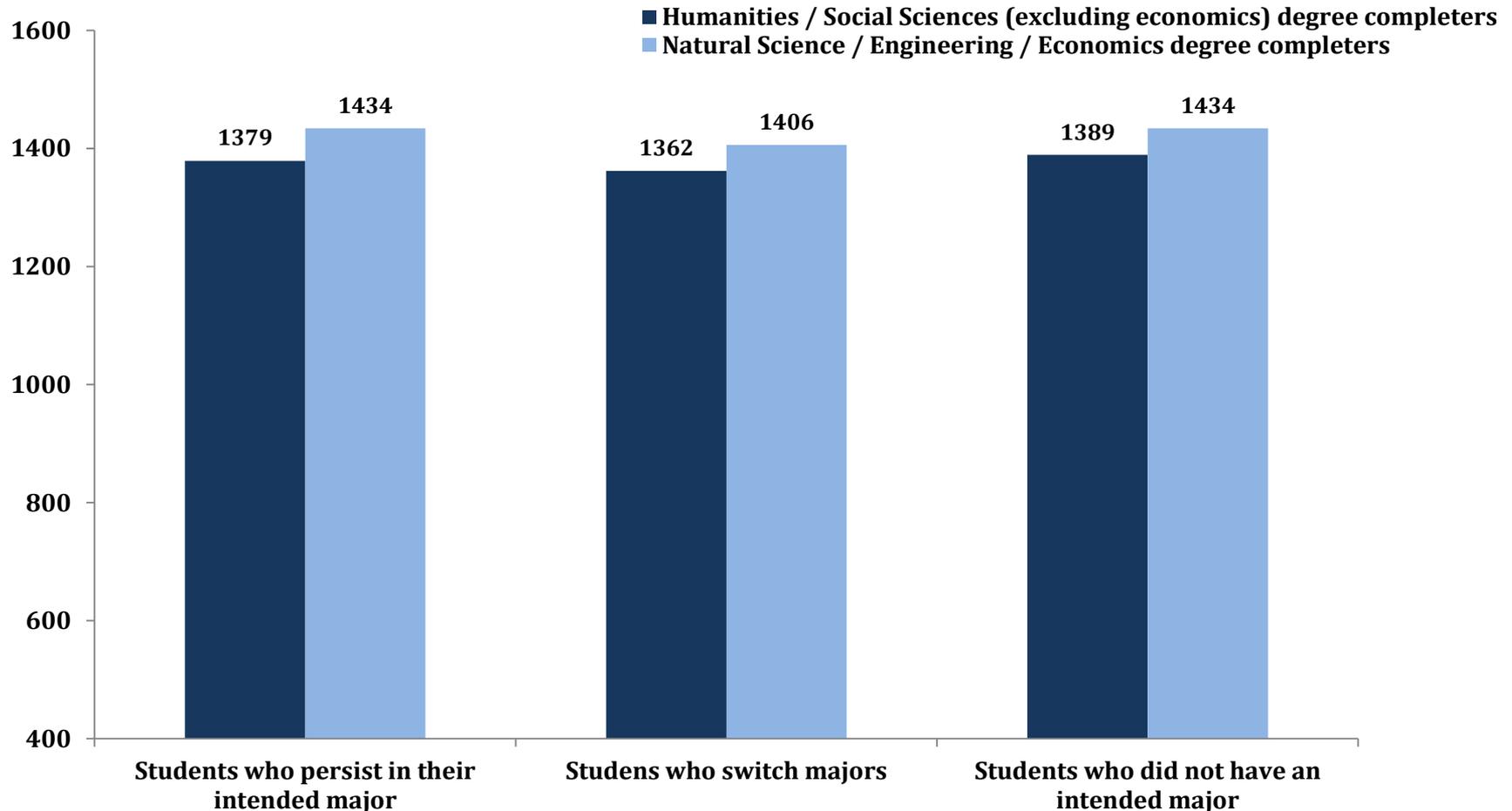


Source: Peter Arcidiacono, Esteban M. Aucejo, & Ken Spenner, What Happens After Enrollment? An Analysis of the Time Path of Racial Differences in GPA and Major Choice (2011) Table 10.

Lower STEM grades cannot be explained by ability levels: Students in high value fields have higher test scores

SAT scores by pre-college intended major and completed major for a sample of Duke undergraduates

Mean SAT points

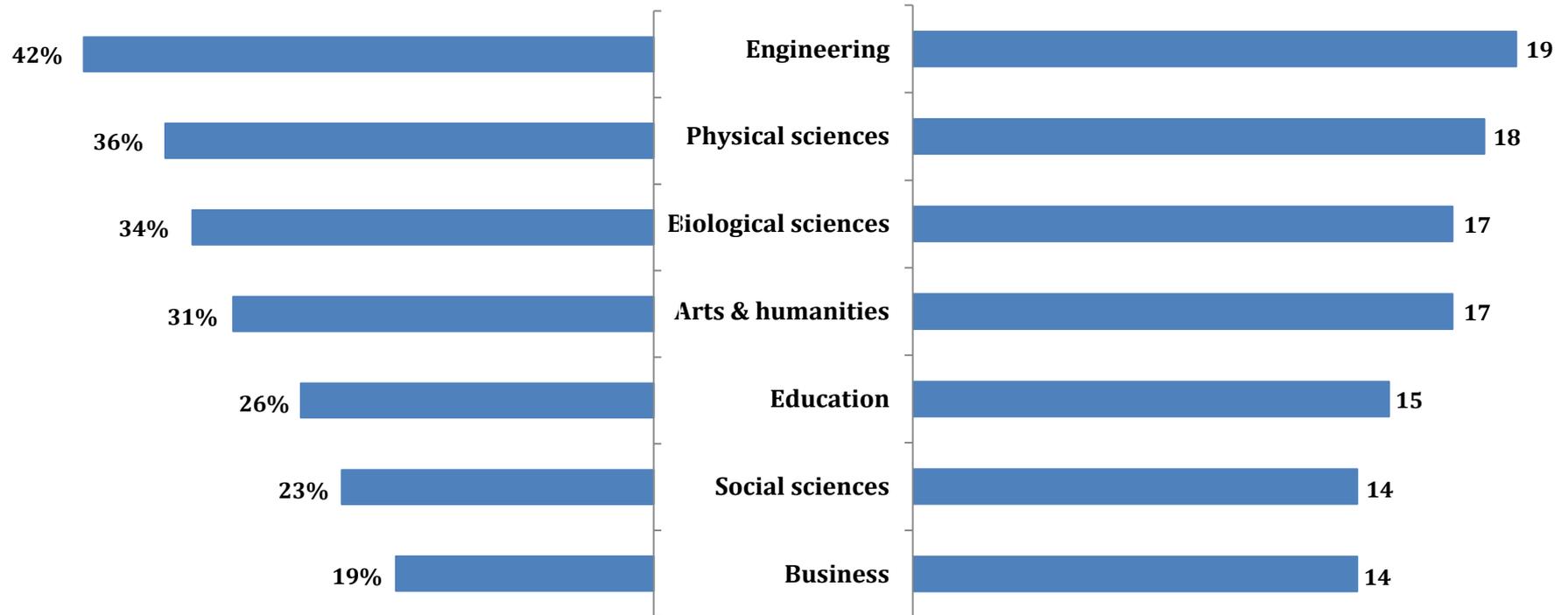


Source: Peter Arcidiacono, Esteban M. Aucejo, & Ken Spenner, What Happens After Enrollment? An Analysis of the Time Path of Racial Differences in GPA and Major Choice (2011) Table 11.

Lower STEM grades cannot be explained by effort: Students in high value fields study more

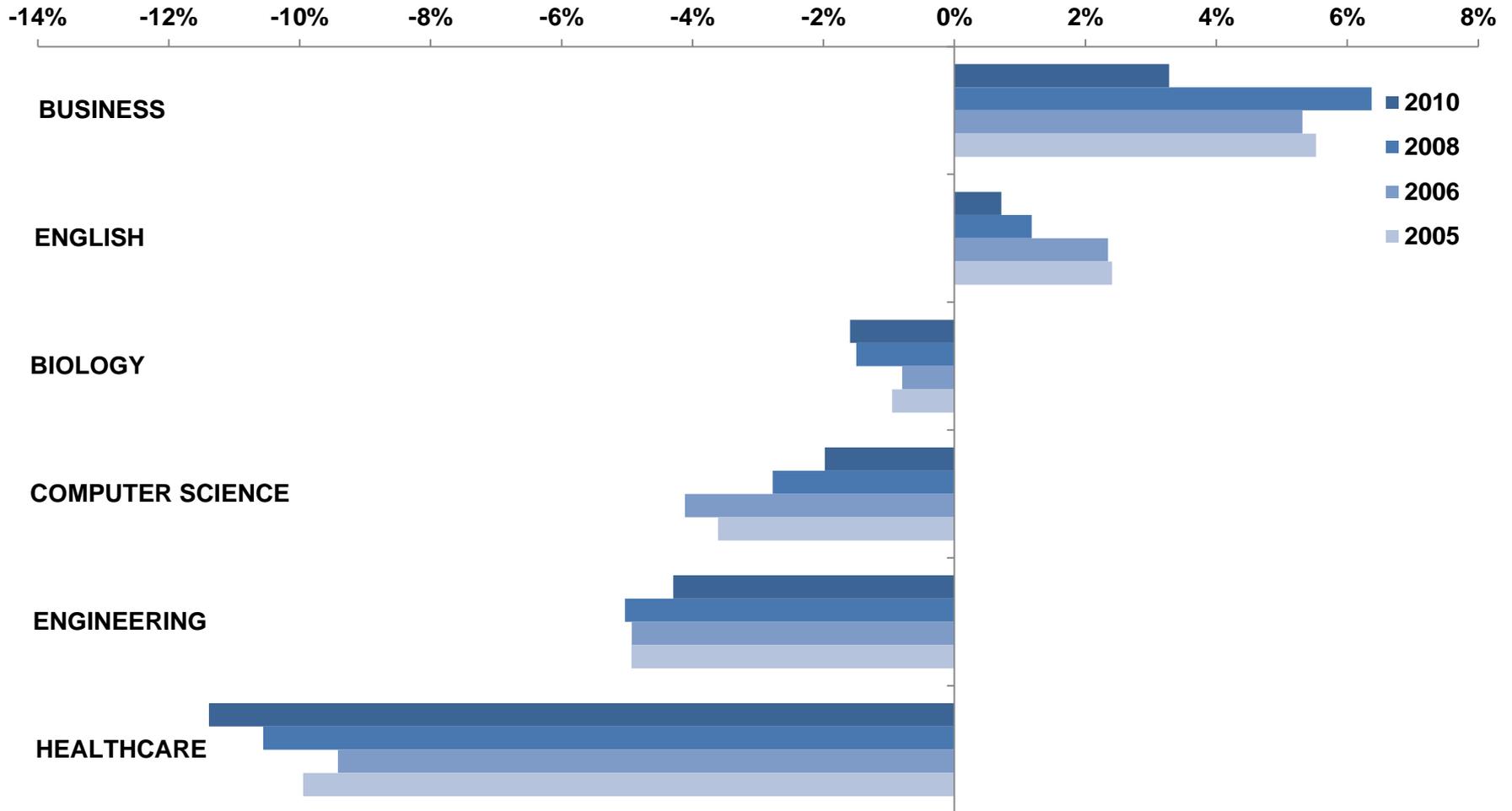
Percent of full time seniors who spend more than 20 hours per week preparing for class, by major

Hours per week spent preparing for class by full time college seniors, by major



Students who initially intend to major in high value STEM fields switch to less demanding fields prior to graduation

Percent of bachelors degrees conferred each year versus percent of college-bound students who intended to major in field four years earlier

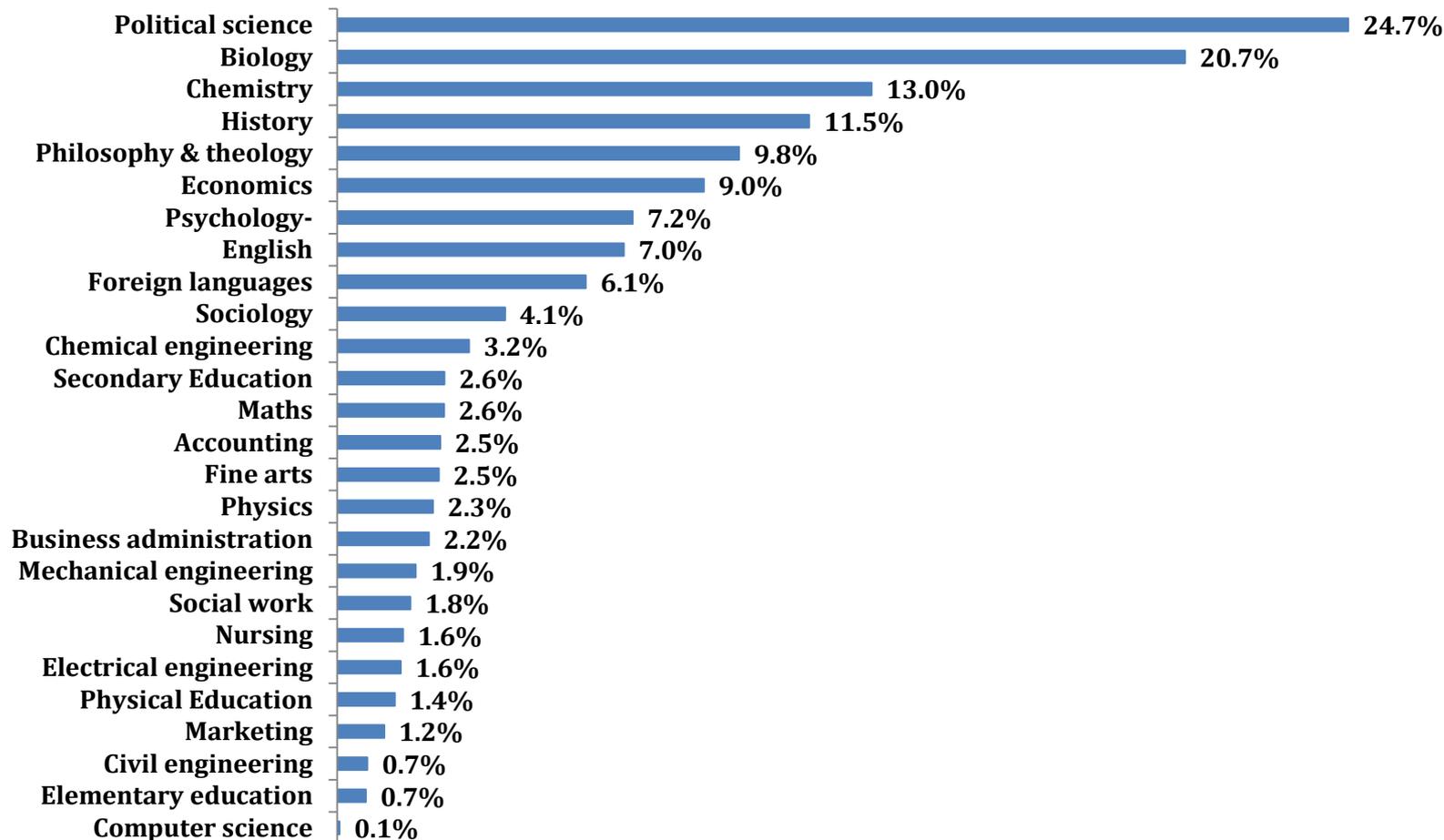


Source: College Board; National Center For Education Statistics

Workers with undergraduate degrees in some fields with low starting salaries (but high grades) are likely to attend law school or medical school

Propensity for Pursuing Professional Degrees by Undergraduate Major

Percent of workers aged 35 to 55 from the 1993 National Survey of College Graduates

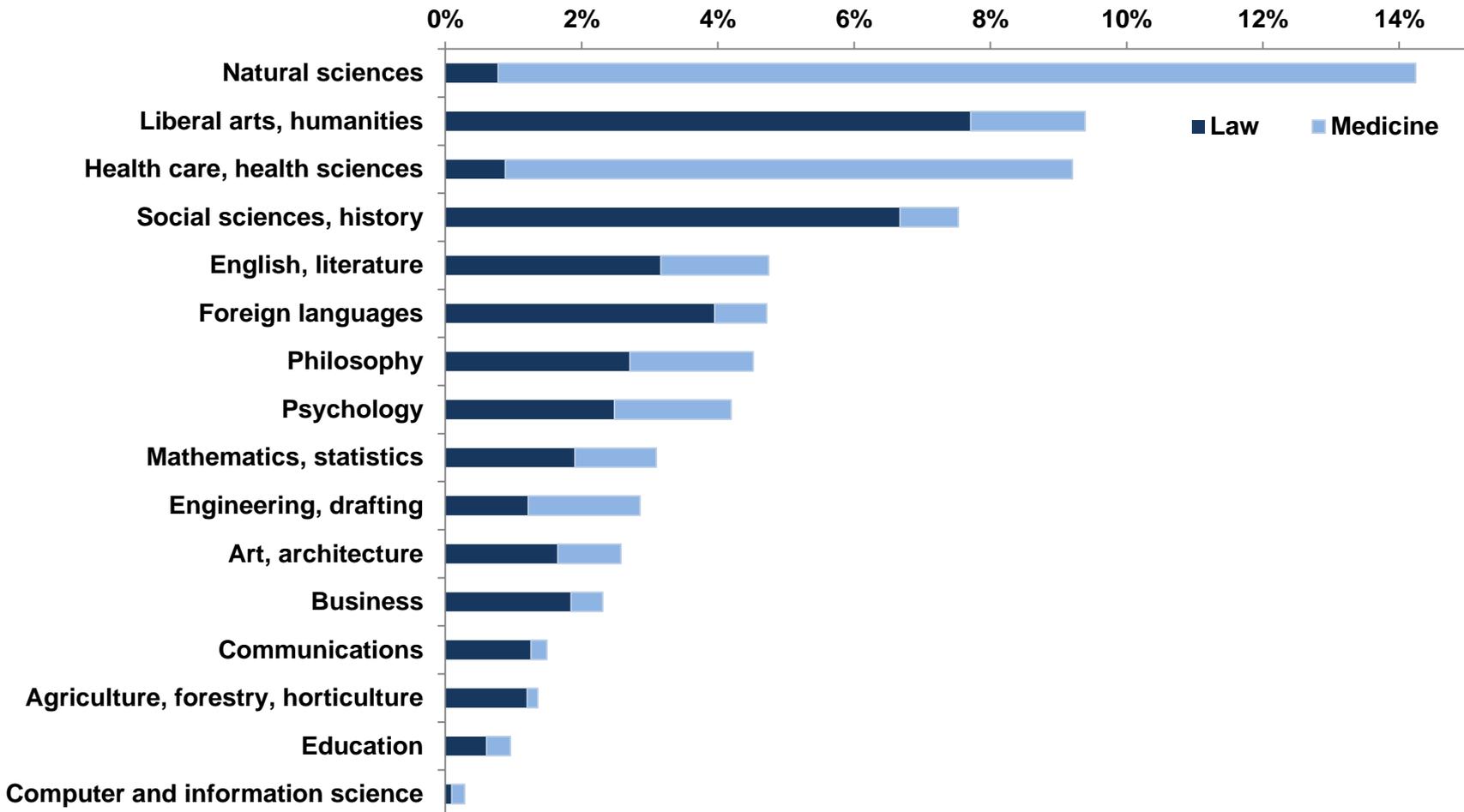


Source: 1993 National Survey of College Graduates; Dan A. Black, Seth Sanders & Lowell Taylor, *The Economic Reward for Studying Economics*, 41 ECON. INQUIRY 365, 371 Table 4 (2003)

Workers with undergraduate degrees in some fields with low starting salaries are likely to attend law school or medical school

Propensity for Pursuing Professional Degrees by Undergraduate Major, 2009

Percent of college graduates aged 18 and over with professional degree



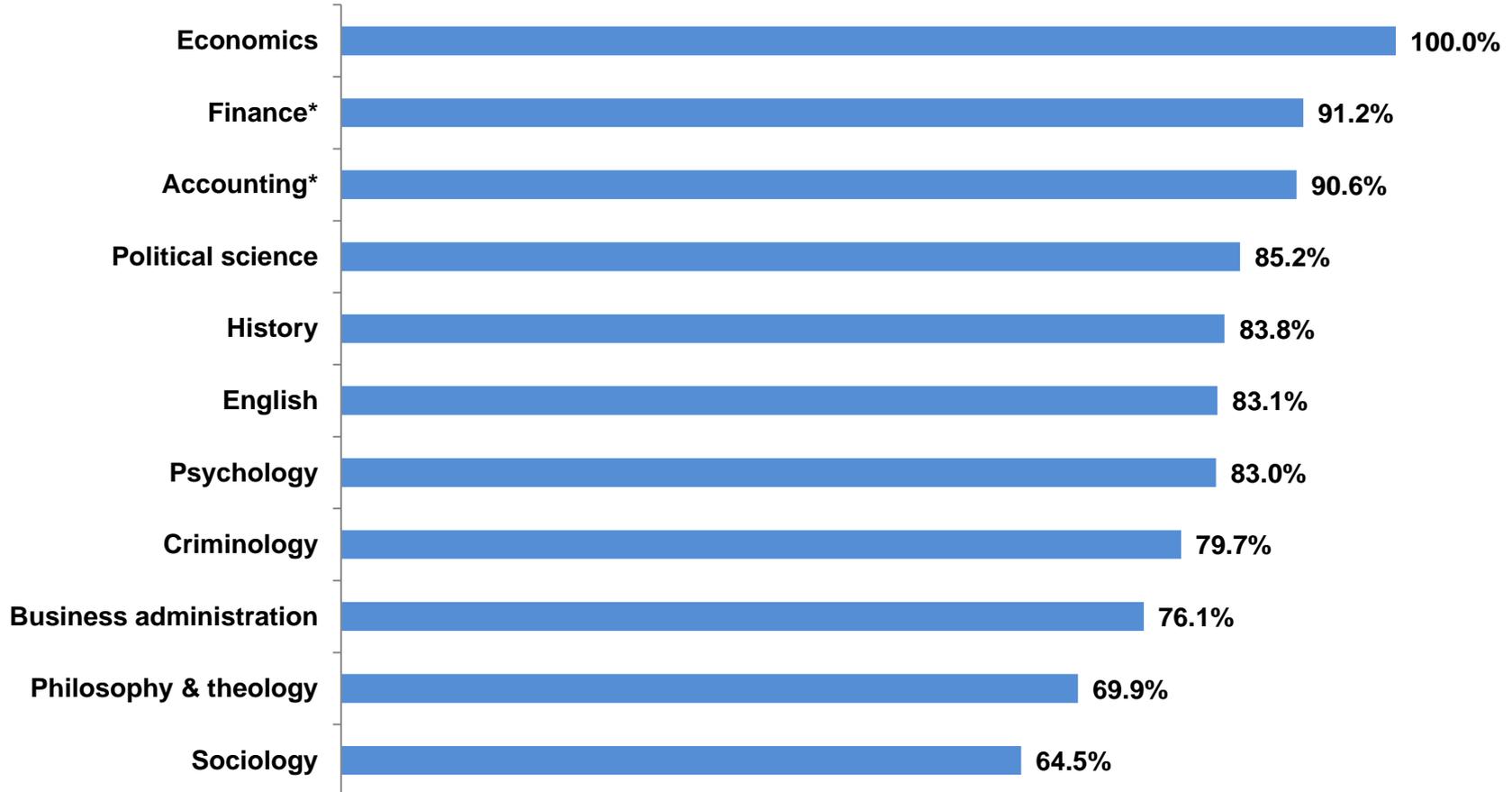
Source: Stephanie Ewart, U.S. Census Bureau, What It's Worth: Field of Training and Economic Status in 2009, 3 Table 3 (Feb. 2012); Survey of Income and Program Participation 2008.

Note: Preprofessional majors, not shown, have the highest rates of professional school attendance, at 23.4% law degrees and 26.8% medical degrees.

Among those with a law degree, workers with high value undergraduate degrees earn the most

Earnings of workers with a law degree, by undergraduate major

Earnings as a percent of earnings for economics majors, workers aged 35 to 55



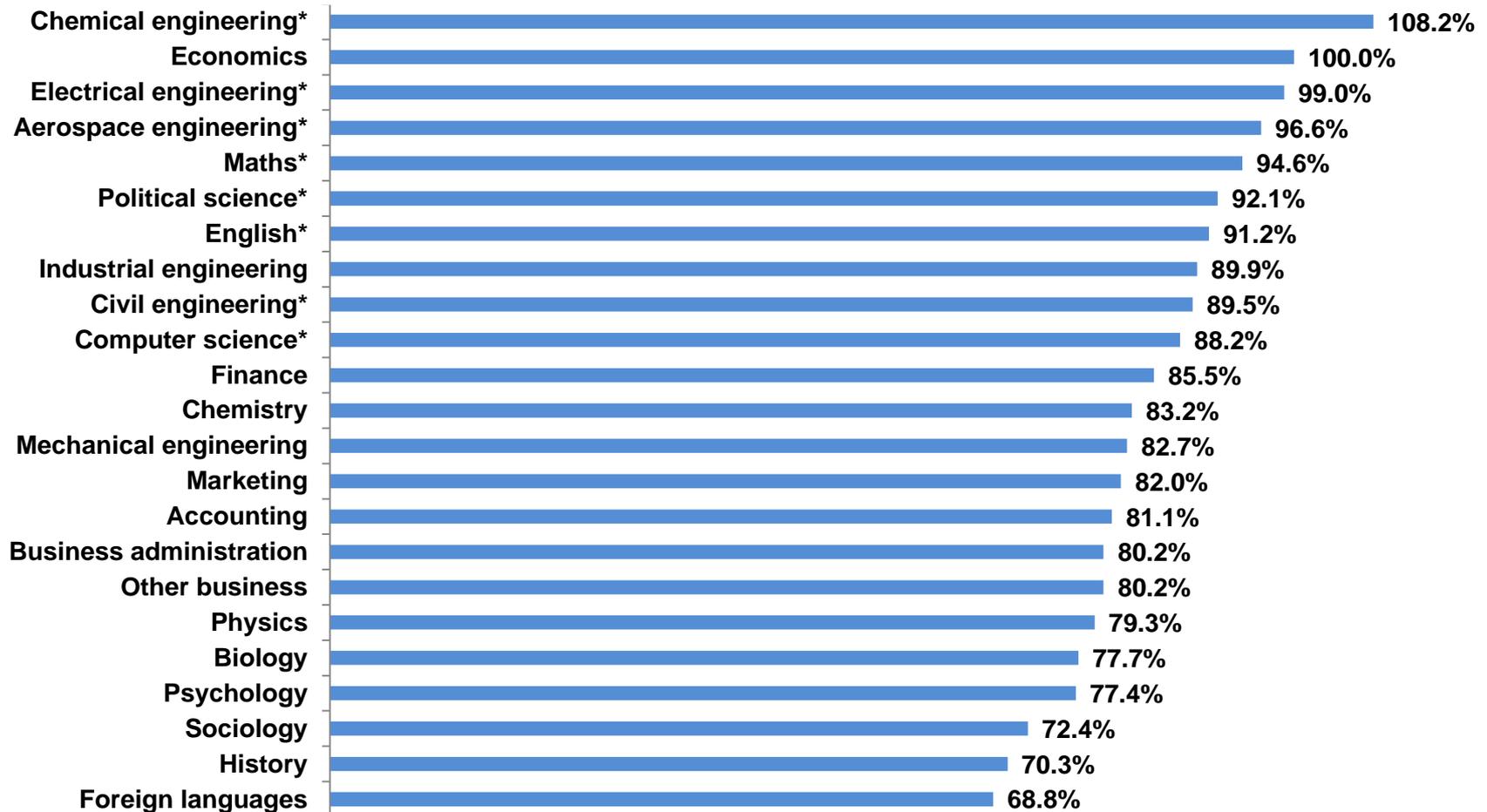
Source: 1993 National Survey of College Graduates; Dan A. Black, Seth Sanders & Lowell Taylor, *The Economic Reward for Studying Economics*, 41 *ECON. INQUIRY* 365, 374 Table 7 (2003)

Note: * No statistically significant difference compared to economics majors. Foreign language not statistically significant and not shown.

MBA's with high value undergraduate majors generally earn more than MBA's with low value undergraduate majors

Earnings of workers with a master's degree in business, by undergraduate major

Earnings as a percent of earnings for economics majors, workers aged 35 to 55



Source: 1993 National Survey of College Graduates; Dan A. Black, Seth Sanders & Lowell Taylor, *The Economic Reward for Studying Economics*, 41 ECON. INQUIRY 365, 373 Table 6 (2003)

Note: * No statistically significant difference compared to economics majors.

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Basic features of risk based pricing

- Data-driven pricing of interest rates on loans
 - Focus on historic data
 - Limited use of forecasting based on anticipated demand and supply

- Focus on factors that are under students' control
 - Choice of major (measured by course completions not declarations)
 - Choice of geographic location of school
 - Ability (?)

- Increase labor market transparency
 - Before students even arrive on campus through institutional rates
 - Each semester, pricing for new loans based on latest labor market data
 - Clear, comprehensible, salient disclosures to students

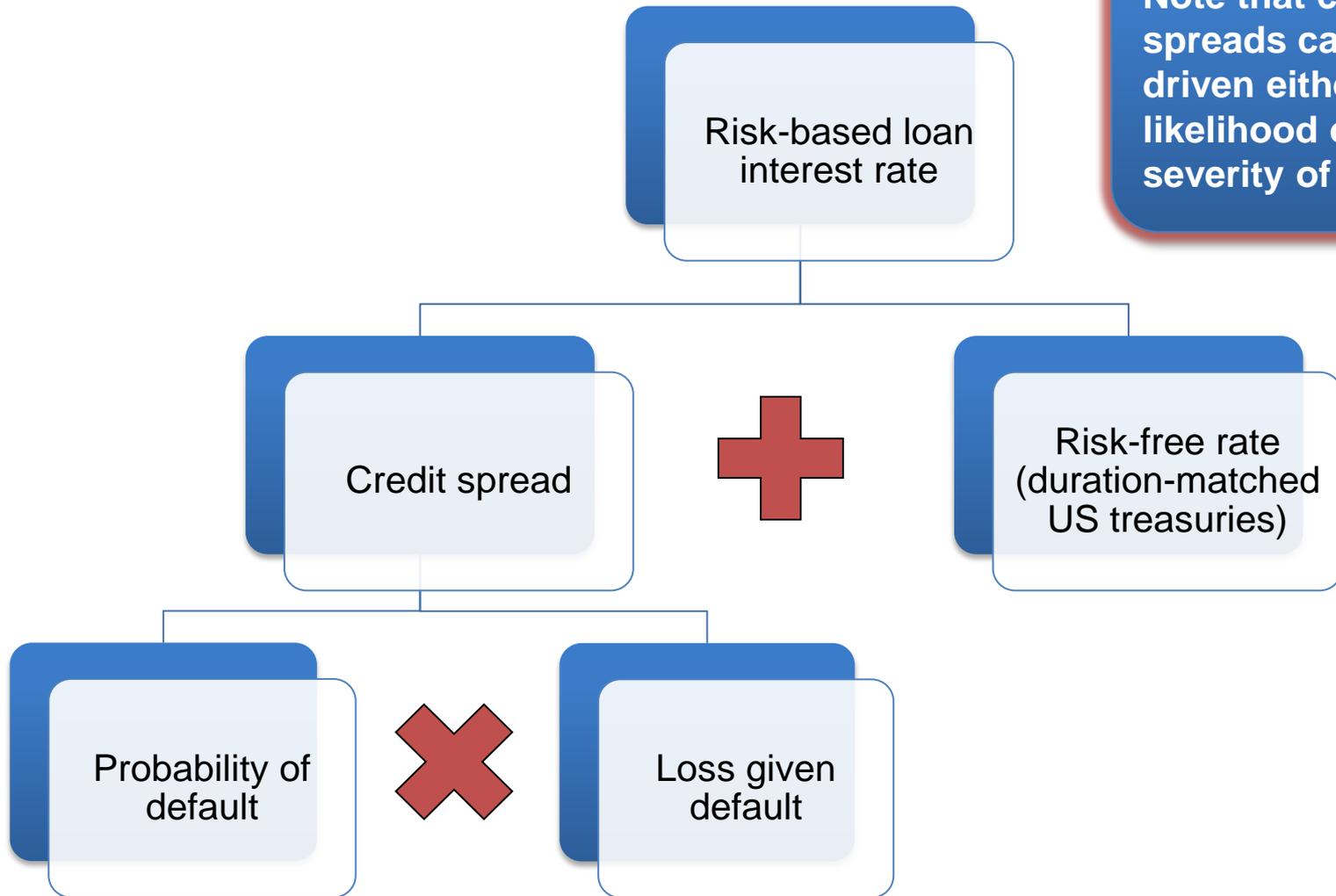
- Certain predictors can be excluded for ethical or moral reasons
 - race
 - parental wealth or income
 - Ability (?)

Theoretical advantages of risk based pricing

- Universities shift resources toward fields that are most in demand, esp. STEM
- Increased employment
- Increased wages
- Better skills matching
- Wage compression and increased socioeconomic mobility
- Increased tax revenue and reduced burdens on social services
- Higher levels of technical and mathematical skill, economy wide

Risk-based pricing would incorporate prevailing interest rates, the probability of default and the loss given default into loan pricing

Simplified risk based pricing equation



Note that credit spreads can be driven either by likelihood or severity of default

Risk-based pricing would incorporate prevailing interest rates, the probability of default and the loss given default into loan pricing

Slightly less simplified risk based pricing equation

The diagram shows the equation $x = \frac{1 + g}{1 - (D \times L)} - 1$ with callout boxes for each variable: **Risk based loan interest rate to break even** (pointing to x), **Risk-free interest rate** (pointing to g), **Annual probability of default** (pointing to D), and **Loss given default** (pointing to L). To the right, a green box lists **Simplifying assumptions:** Lender is risk neutral, Lender not subject to liquidity risk, Lender can borrow at risk free rate, and No administrative costs.

$$x = \frac{1 + g}{1 - (D \times L)} - 1$$

Risk based loan interest rate to break even

Risk-free interest rate

Annual probability of default

Loss given default

Simplifying assumptions:

- Lender is risk neutral
- Lender not subject to liquidity risk
- Lender can borrow at risk free rate
- No administrative costs