

**ECONOMIC VIEW**

## ***Engineers Sprint Ahead, but Don't Underestimate the Poets***

By David Deming

Sept. 20, 2019

For students chasing lasting wealth, the best choice of a college major is less obvious than you might think.

The conventional wisdom is that computer science and engineering majors have better employment prospects and higher earnings than their peers who choose liberal arts.

This is true for the first job, but the long-term story is more complicated.

The advantage for STEM (science, technology, engineering and mathematics) majors fades steadily after their first jobs, and by age 40 the earnings of people who majored in fields like social science or history have caught up.

This happens for two reasons. First, many of the latest technical skills that are in high demand today become obsolete when technology progresses. Older workers must learn these new skills on the fly, while younger workers may have learned them in school. Skill obsolescence and increased competition from younger graduates work together to lower the earnings advantage for STEM degree-holders as they age.

Second, although liberal arts majors start slow, they gradually catch up to their peers in STEM fields. This is by design. A liberal arts education fosters valuable “soft skills” like problem-solving, critical thinking and adaptability. Such skills are hard to quantify, and they don't create clean pathways to high-paying first jobs. But they have long-run value in a wide variety of careers.

Computer science and engineering majors between the ages of 23 and 25 who were working full time earned an average of \$61,744 in 2017, according to the Census Bureau's American Community Survey. This was 37 percent higher than the average starting salary of \$45,032 earned by people who majored in history or the social sciences (which include economics, political science and sociology). Large differences in starting salary by major held for both men and women.

Men majoring in computer science or engineering roughly doubled their starting salaries by age 40, to an average of \$124,458. Yet earnings growth is even faster in other majors, and some catch up completely. By age 40, the average salary of all male college graduates was \$111,870, and social science and history majors earned \$131,154 — an average that is lifted, in part, by high-paying jobs in management, business and law.

The story was similar for women. Those with applied STEM majors earned nearly 50 percent more than social science and history majors at ages 23 to 25, but only 10 percent more by ages 38 to 40.

One reason for the narrowing gap is that STEM jobs change rapidly, and workers must constantly learn new skills to keep up. In a recent working paper with a Harvard doctoral student, Kadeem Noray, I calculated how much the skills required for different jobs changed over time. Help-wanted ads for jobs like software

developer and engineer were more likely to ask for skills that didn't exist a decade earlier. And the jobs of 10 years ago often required skills that have since become obsolete. Skill turnover was much higher in STEM fields than in other occupations.

We can also see this by looking at changes in college course catalogs. One of the largest and most popular courses in the Stanford computer science department is CS229 — Machine Learning, taught by the artificial intelligence expert and entrepreneur Andrew Ng. This course did not exist until 2003, when Professor Ng taught it for the first time with 68 students, and very little like it existed anywhere on college campuses 15 years ago. Today, the machine learning courses at Stanford enroll more than a thousand students.

In contrast, much less has changed in my home discipline, economics, where we still mostly offer the classics like intermediate microeconomics or public finance.

Since new technical skills are always in high demand, young college graduates who have them earn a short-run salary premium. Yet when the job changes, these now experienced workers must learn new technical skills to keep up with fresh college graduates and a constant stream of talent from abroad.

The result is slower salary growth and high exit rates from the STEM work force. Between the ages of 25 and 40, the share of STEM majors working in STEM jobs falls from 65 percent to 48 percent. Many of them shift into managerial positions, which pay well but do not always require specialized skills.

Why do the earnings of liberal arts majors catch up? It's not because poetry suddenly pays the bills. Midcareer salaries are highest in management and business occupations, as well as professions requiring advanced degrees such as law. Liberal arts majors are more likely than STEM graduates to enter those fields.

A traditional liberal arts curriculum includes subjects, like philosophy and literature, that seemingly have little relevance in the modern workplace. Yet many of the skills most desired by employers are also quite abstract.

According to a 2018 survey by the National Association of Colleges and Employers, the three attributes of college graduates that employers considered most important were written communication, problem-solving and the ability to work in a team. Quantitative and technical skills both made the top 10, alongside other "soft" skills like initiative, verbal communication and leadership. In the liberal arts tradition, these skills are built through dialogue between instructors and students, and through close reading and analysis of a broad range of subjects and texts.

Liberal arts advocates often argue that education should emphasize the development of the whole person, and that it is much broader than just job training. As an educator myself, I agree wholeheartedly.

But even on narrow vocational grounds, a liberal arts education has enormous value because it builds a set of foundational capacities that will serve students well in a rapidly changing job market.

To be clear, I am not suggesting that students should avoid majoring in STEM fields. STEM graduates still tend to have high earnings throughout their careers, and most colleges require all students — including STEM majors — to take liberal arts courses.

But I do think we should be wary of the impulse to make college curriculums ever more technical and career focused. Rapid technological change makes the case for breadth even stronger. A four-year college degree should prepare students for the next 40 years of working life, and for a future that none of us can imagine.

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A version of this article appears in print on Sept. 21, 2019, Section BU, Page 8 of the New York edition with the headline: Engineers Start Fast, but Poets Can Catch Up