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Robots and Jobs in the U.S. Labor Market

With America's workers already squeezed by forces ranging from international competition to offshoring to new information technologies, concern is growing about the impact of robots on jobs and wages.

In **Robots and Jobs: Evidence from U.S. Labor Markets** (NBER Working Paper No. 23285), [Daron Acemoglu](#) and [Pascual Restrepo](#) find that deployment of robots reduces employment and wages, but they caution that it is difficult to measure net labor market effects.

Since at least the start of the Industrial Revolution, economists and policy makers have pondered how relentless technological advances might impact labor markets. John Maynard Keynes warned in 1929 of coming "technological unemployment" and Wassily Leontief predicted several decades later that "labor will become less and less important." In recent years, a range of studies has estimated that nearly half of all U.S. workers' jobs will be at risk of being automated over the next two decades, and noted that this risk extends beyond laborers to include many white-collar occupations with substantial routine components.

The researchers note that automation has several effects on the labor market. It may displace the workers performing a particular job

in a particular industry, leading to reduced employment opportunities and wages for workers who historically held such positions. However, other sectors and occupations may expand to soak up labor freed from the tasks performed by machines,

and it is even possible that productivity gains due to new automation technologies may expand employment possibilities in the industries in which they are deployed.

The researchers focus on how the adop-

tion of Robotics (IFR) definition of robots as autonomous, reprogrammable, multipurpose machines; this excludes single-purpose automated machinery and artificial intelligence technologies. By combining data from the IFR, the U.S. Bureau of the Census, and other

On average, the arrival of one new industrial robot in a local labor market coincides with an employment drop of 5.6 workers.

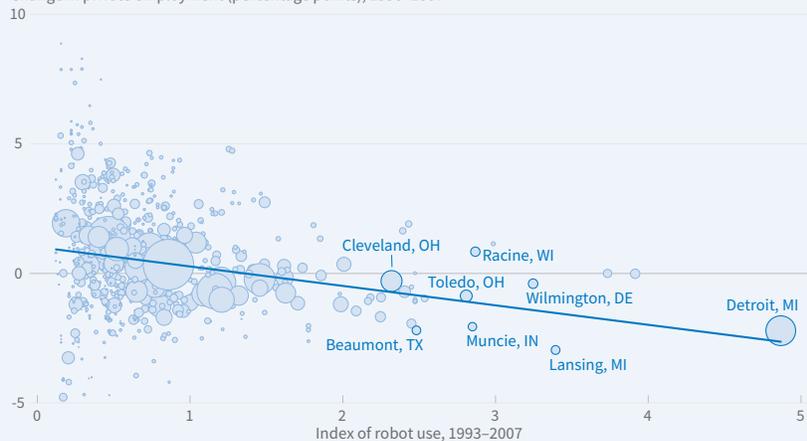
sources, the researchers analyze the effect on labor markets of increases in industrial robot usage in 19 industries between 1990 and 2007. They measure the within-industry rate of robot adoption in countries other than the U.S., and pair that with information on the location of industrial employment across commuting zones to construct a measure of potential exposure to robots for each local labor market.

The researchers find large and robust negative effects of robots on employment and wages. They estimate that one more robot per thousand workers reduces the employment-to-population ratio by between 0.18 and 0.34 percentage points, and is associated with a wage decline of between 0.25 and 0.5 percent. The effects

are most pronounced on industries most exposed to robots, on workers with less than a college degree, and on routine manual,

Employment and Exposure to Robots

Change in private employment (percentage points), 1990–2007



Larger circles denote larger commuting zones

Source: Researchers' calculations using International Federation of Robotics, U.S. Census, and other data

tion of a specific type of automation technology—industrial robots—affects local labor markets. They use the International Federation

blue-collar, assembly, and other related occupations.

Robots appear to have a more negative impact on the employment of men than of women.

Noting that there have been several other significant shocks to the U.S. labor market during their sample period, the researchers investigate whether growing imports from China and Mexico, offshoring, access

to other computer technology, or changes in other components of the capital stock might confound their results. Their results are robust to all of these controls.

—Jay Fitzgerald

Early Evidence on the Effects of the ACA

Increased access to affordable health care does not necessarily translate to a decrease in smoking, substance abuse, or obesity, or to better self-reported health. Those are among the principal findings of **Early Effects of the Affordable Care Act on Health Care Access, Risky Health Behaviors, and Self-Assessed Health** (NBER Working Paper No. 23269), by Charles Courtemanche, James Marton, Benjamin Ukert, Aaron Yelowitz, and Daniela Zapata.

The researchers analyze data spanning the years 2011 to 2015 from the Behavioral Risk Factor Surveillance System, an annual nationwide telephone survey conducted by state health departments. They focus on adults aged 19 to 64. The survey records responses from more than 300,000 individuals each year.

The researchers compare responses before and after the Affordable Care Act (ACA) took effect. They also compare survey results in states that fully adopted the ACA, embracing extended Medicaid coverage, with those that did not. They estimate that, when fully adopted, the ACA reduced the number of uninsured individuals by 44 percent, while also reducing the number without a primary care doctor by 12 percent. The number of respondents who reported that they had foregone care because of cost dropped by 28 percent, and the number who had not had an annual health checkup declined by 10 percent.

Despite these improvements in health

care access, the researchers find no statistically significant differences in risky behaviors and self-assessed health status between respondents in pre- and post-ACA surveys. That is the case both in states that expanded Medicaid and in those that did not. When they disag-

gregate their findings and consider smaller age groups, the researchers report some evidence that the ACA improved self-assessed health among older, non-elderly adults, particularly in Medicaid expansion states.

The researchers suggest that health literacy may lag behind health access, so it may take time before the newly insured find suitable care

insurance coverage increased by 8.3 percentage points, but the probability of having a checkup rose by less than half that: 3.6 percentage points. The researchers also note that with better access to health care, some individuals may be less concerned about the financial con-

sequences of poor health, and consequently devote less attention to healthy behaviors.

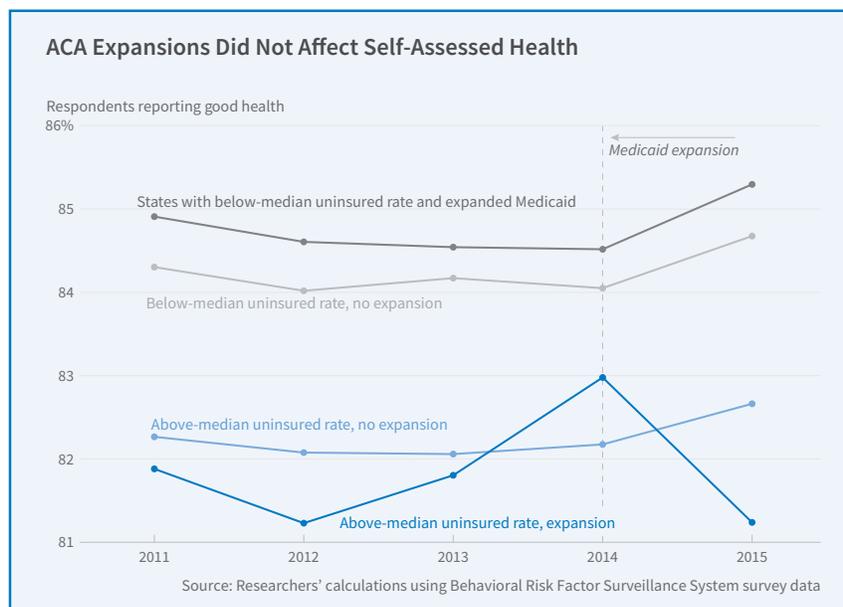
The researchers caution that their findings offer only a partial picture of the ACA's impact. They do not, for example, capture the effect of expanded coverage on clinical outcomes such as the treatment of diabetes or asthma, except insofar as such treatments might affect self-reported health.

“Improved access to medical care may be of only limited value with regard to health behaviors since they are generally not as easy to treat as acute conditions,” the researchers write, adding that the impact on self-assessed health may take longer than two years to register. They also point to the importance of studying financial as well as physical health. “[P]rotection against financial risk is a critical component of the gains from insurance, so the consumption smoothing benefits

of the ACA could confer a sizable benefit even in the absence of discernable short-run health effects.”

—Steve Maas

The Affordable Care Act has reduced the percentage of uninsured Americans by 44 percent, but whether it has had positive health effects remains unclear.



givers, modify their health-related behaviors, and follow through on treatment plans. As support for this view, they note that, in those states where the ACA was fully implemented,

Exploring Pathways to Economic Development

Many countries in the developing world have experienced a remarkable period of economic development over the last several decades. Besides India and China, which registered record growth rates, countries in sub-Saharan Africa and Latin America have managed to match or exceed their performance of the 1960s and first half of the 1970s.

Even a cursory look at the recent growth champions indicates that their experience differs greatly from the standard East Asian path. East Asian countries such as South Korea, Taiwan, and China grew through rapid, export-oriented industrialization. By contrast, none of the recent growth experiences outside East Asia show evidence of rapid industrialization. Instead, Latin American countries have experienced premature deindustrialization, while in Africa manufacturing industries are barely holding their own in most countries.

What then is driving economic growth in these countries and how sustainable is this growth? In **The Recent Growth Boom in Developing Economies: A Structural Change Perspective** (NBER Working Paper No. 23132), [Xinshen Diao](#), [Margaret McMillan](#), and [Dani Rodrik](#) offer a structuralist perspective on this experience, focusing on the role of structural change in driving economy-wide labor productivity growth. In East Asian countries, the movement of labor from low-productivity agriculture to modern manufacturing industries and associated activities played a critical role. The researchers ask whether there was a similar transformation in the recent crop of growth accelerations, and whether the expansion of other modern activities, such as services, played the role that industrial-

ization played in East Asia. They examine the relationship between patterns of structural change and labor productivity growth within specific industries, focusing on country-specific growth accelerations that started as early as 1988 and as

Developing countries in Latin America and Africa have not followed the rapid, export-oriented industrialization strategy that was used in East Asia.

late as 2003, and lasted for at least seven years.

Contrary to the experience in East Asia, these recent growth accelerations were based on either rapid within-sector labor productivity growth, which was the typical pattern in Latin America,

been accompanied in these countries by negative labor productivity growth within non-agricultural sectors such as manufacturing and services. This experience stands in sharp contrast to the classic East Asian growth experience in South

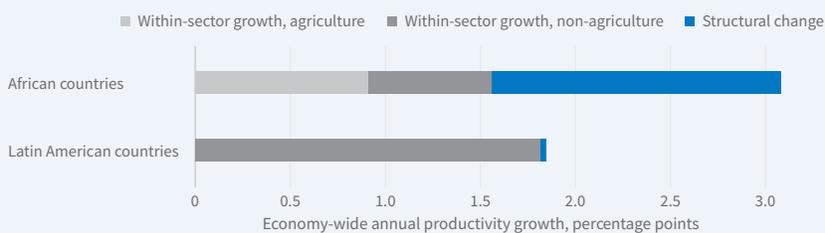
Korea and China, in which both components of labor productivity contributed strongly to overall growth. Moreover, the East Asian pattern also seems to have been replicated in more recent Asian growth accelerations, such as those in Bangladesh, Cambodia, Laos, Vietnam, and India.

The researchers find that the pattern in East Asia of strong productivity growth within individual sectors, as well as a shift of economic activity across sectors toward more productive ones, is consistent with growth being driven

mainly by positive productivity shocks to the modern sectors. The African model, by contrast, is consistent with growth being driven not by the modern sector, but by positive aggregate demand shocks due to foreign transfers, for example, or productivity growth in traditional agriculture.

These patterns suggest that positive structural change in African countries may be driven mainly from the demand side, the researchers conclude, whether due to external transfers or induced demand effects from increased agricultural incomes. This in turn raises the issue of the sustainability of recent growth in Africa and highlights the importance of productivity-enhancing public investments in areas such as education, health, and infrastructure.

Decomposition of Recent Growth in Africa and Latin America



Source: Researchers' calculations using Groningen Growth and Development Center data

or growth-increasing structural change, the typical pattern in Africa, but rarely both at the same time. In fact, there is a strong negative correlation between the two components of growth across countries, with India as the sole exception. In Latin America, within-sector labor productivity growth has been impressive, but growth-promoting structural change has been very weak. The researchers report that, excluding agriculture, structural change has made a negative contribution to overall growth, meaning labor has moved from high-productivity sectors to low-productivity activities. By contrast, the situation in Africa is the mirror image of the Latin American case. Growth-promoting structural change has been significant, especially in Ethiopia, Malawi, Senegal, and Tanzania, but has

The Global Rise of Corporate Saving

Since 1980, the global corporate sector has increased its saving rate and switched from being a net borrower to being a net lender to the rest of the economy. This change has occurred in most industries and in a majority of countries. In **The Global Rise of Corporate Saving** (NBER Working Paper No. 23133), Peter Chen, Loukas Karabarbounis, and Brent Neiman analyze this trend and document a parallel decline in household saving.

as firm-level data from Compustat. In the country-level data, they find that corporate saving as a share of global GDP rose by nearly 5 percent between 1980

three decades, notably falling real interest rates, declining prices for capital goods, and reductions in corporate taxes, could contribute to rising corpo-

Falling labor shares and rising corporate profits have translated into higher corporate saving and turned the corporate sector from a net borrower to a net saver, while household saving has declined.

and 2013. As a share of corporate gross value added, corporate saving increased in every region except Latin America and the Caribbean, and in all of the world's 10 largest economies.

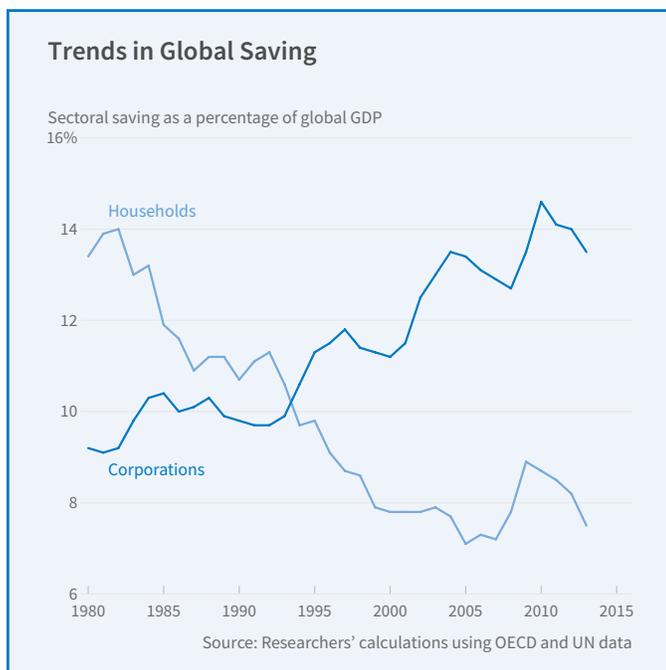
rate profits and declining labor income. Rising markups on products sold by the corporate sector could have the same effect.

While corporate saving has risen, household saving has declined. As a share of global GDP, household saving dropped by nearly 6 percent between 1980 and 2013, when corporate saving increased by slightly less. This has

The rise of corporate saving has coincided with a decline in labor compensation as a share of corporate gross value added. Thus the rise in corporate saving is closely tied to the rising share of capital income in advanced economies. The researchers find that the shares of major corporate expenses other than labor, such as taxes and interest payments, have been

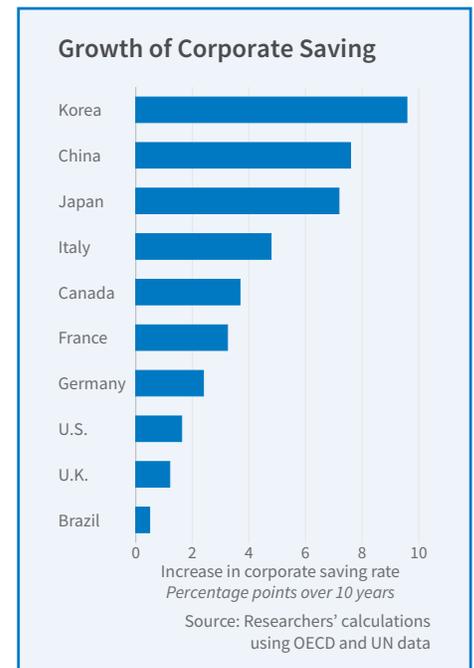
relatively stable over time. They note that as the labor share fell and corporate profits rose, firms did not sufficiently increase their dividends, which would have passed greater profits along to shareholders. Instead, dividends lagged the profit rise, resulting in greater corporate saving.

The researchers find no evidence that a decline in manufacturing, changes in the market power of specific firms or industries, or alterations in a particular country's financial practices were key drivers of the rise in corporate saving. They suggest that a number of changes in the global economy during the last



Corporate saving equals profits less dividend payments to shareholders; it is sometimes referred to as "retained earnings." Corporations can deploy their saving by investing in physical and intangible capital, accumulating cash reserves, repaying debt, or buying back shares. In the last two decades much of corporate net lending was used to accumulate cash. The use of net lending for share buybacks slowed after the financial crisis of 2008.

To investigate the rise in corporate saving, the researchers use national income accounts data from the United Nations and the Organisation for Economic Co-operation and Development, as well



resulted in a shift in the sources of finance for global investment. "Whereas in the early 1980s most of investment spending at the global level was funded by saving supplied by the household sector, by the 2010s nearly two-thirds ... was funded by saving supplied by the corporate sector."

—Linda Gorman

Patent Awards Stoke Startup Growth

Patent applications are assigned to examiners at the U.S. Patent and Trademark Office on a quasi-random basis. The median examiner grants a patent to 61.5 percent of the applications he or she considers, but the percentage varies substantially across examiners. This creates a “patent lottery” of sorts: an applicant who draws an examiner in the 75th percentile of willingness to grant has an 11.8 percentage-point higher probability of getting a patent than one in the same industry-year who draws an examiner in the 25th percentile. This variation in patent award probability is arguably unrelated to patent quality.

Drawing a more lenient patent examiner can make a huge difference for a startup firm, according to research reported in **What Is a Patent Worth? Evidence from the U.S. Patent “Lottery”** (NBER Working Paper No. 23268). After five years, the average employment growth of these firms is 55 percent greater, and average sales growth is 80 percent greater, than the comparable measures for firms that draw less-lenient examiners.

“A patent grant sets a startup on a growth path through funding that helps transform its ideas into products and services that generate jobs, revenues, and follow-on inventions,” write researchers [Joan Farre-Mensa](#), [Deepak Hegde](#), and [Alexander Ljungqvist](#). “For the average startup in our sample, these estimates imply that receiving a patent leads to 16 additional employees after five years, and \$10.6 million in additional sales cumulated over five years after winning the patent lottery.” The effect is particularly strong for information-technology startups.

By examining all 34,215 first-time patent applications for U.S.-based startups from 2001 through 2013, the researchers estimate a patent’s private value. They

Startups that are awarded patents in a “quasi-random” way experience faster employment and sales growth than their counterparts with unsuccessful patent applications.

compare firms that applied for patents and received them with firms that applied but did not. Previous studies have compared patent winners to firms without patents, but it is hard to establish a patent’s value from this comparison because some firms without patents may have chosen other means to protect their intellectual property.

Patent lottery “winners” do not just

approval rate on their applications, suggesting an increase in innovation quality. The researchers stress that their empirical methods determine “winners” through

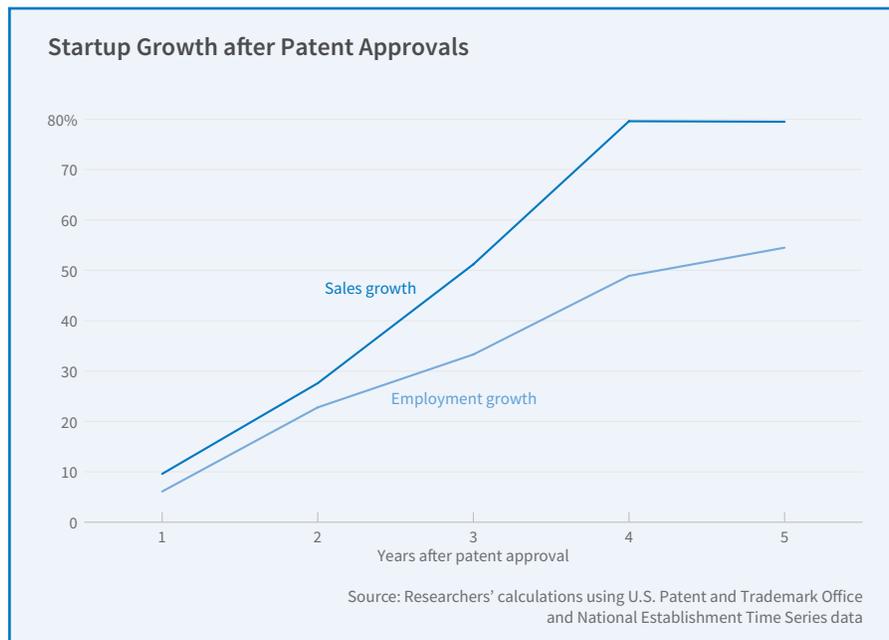
the patent lottery, not by the quality of the first patent, which avoids many potentially confounding effects.

Patents appear to serve as a kind of quality seal of approval to would-be investors. Winning the patent lottery more than doubles the likelihood that a firm is able to raise its first or second round of venture capital funding. This effect is driven by firms founded by less-experienced entrepreneurs; there is no effect for firms with experienced founders. The researchers also do not find any differences between “winners” and “losers” of the patent lottery for raising venture capital after the second round of funding.

Winning a patent appears to have a particularly large impact on firms in the IT field. IT startups tend to have young founders and products with uncertain demand and relatively high risk of

imitation. Winning a patent gives would-be investors more confidence in the quality of the technology and allows the entrepreneurs to discuss their work freely without fear of having it copied. In biochemistry, in contrast, where the effect of a patent “win” is more muted, founders tend to be older, more-experienced scientists whose previous work can be more easily evaluated.

—*Laurent Belsie*



grow faster, they are also more innovative in the years following their patent award. This is likely to be due to the fact that “winners” enjoy easier access to funding from venture capitalists, banks, and public investors. Firms that receive a first patent are awarded 42.3 percent more subsequent patents than firms whose first patent application is denied. Winning firms apply for more patents and also exhibit a higher

Marriageability Concerns and Professional Ambitions

Some women avoid actions that would help their careers in an effort to appear more marriageable, according to the results of experiments conducted with students starting an elite U.S. MBA program. **Leonardo Bursztyn**, **Thomas Fujiwara**, and **Amanda Pallais** report those findings in **'Acting Wife': Marriage Market Incentives and Labor Market Investments** (NBER Working Paper No. 23043).

In their primary experiment, the school's career center distributed a questionnaire to students designed to be used by the career center in first-year internship placement—a central part of an MBA education that is considered to have a substantial impact on career prospects.

Students were asked about desired salary, willingness to travel, willingness to work long hours, and overall professional ambition. On these dimensions, answers that make women more desirable to employers may make them less desirable to potential romantic partners, the researchers found. Some randomly selected students believed their answers would be seen only by a career counselor, while the remainder believed their classmates would see their answers as well.

When single women believed that only a career counselor would see their responses, they reported similar preferences and abilities to other students. However, when they thought their classmates would see their answers, they reported \$18,000 less in desired yearly compensation and they reported being willing to work four fewer hours per week and travel seven fewer days per month.

They reported less ambition and less tendency for leadership, though they did not change their self-reports on a placebo question about writing abilities, a skill not penalized in the marriage

Single women were less likely to display high levels of ambition when they believed that their preferences would be shared with single male classmates.

market. Women in relationships, single men, and men in relationships did not adjust their answers when they thought that their peers would see their responses.

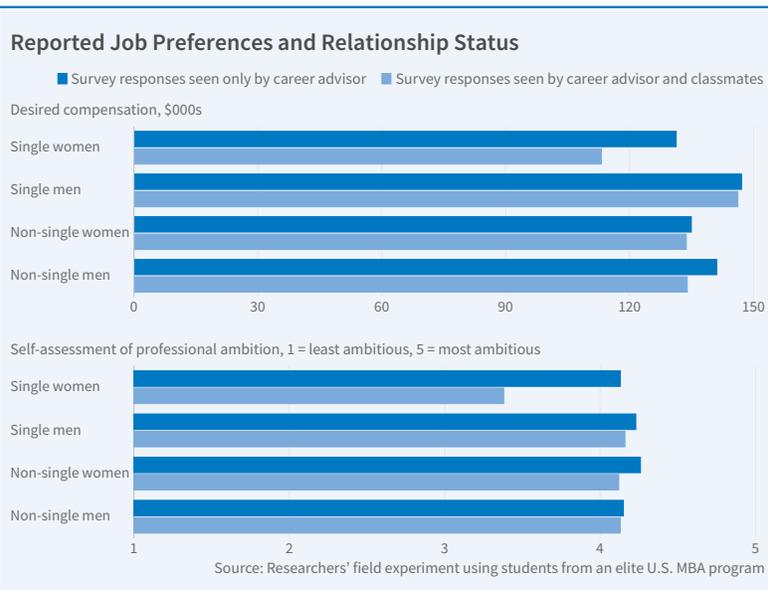
In a supplemental study, students were given a different questionnaire, also to be passed on to the career center. In this questionnaire they were

that they would prefer a job with a higher salary and requiring 55 to 60 hours a week over a job with a lower salary requiring 45 to 50 work hours. When placed with male peers, only 42 percent of

women expressed this preference. Similarly, with female peers, 79 percent of single women reported preferring a job with quicker promotion to partner but substantial travel over a job with slower and less certain promotion but no travel. When placed with male peers, only 37 percent of women chose that option. Single women were also substantially less likely to choose the career-focused option when there were more single—as opposed to married—men in the group.

The researchers found a similar pattern in class grades, which this business school shares with employers. While married and unmarried women performed identically on exams and problem sets—grades that can be kept from classmates—unmarried women had substantially lower participation grades. Marital status did not predict participation grades for men. In an additional survey, three-fourths of single female students reported that they had at some point avoided actions that they thought would help their careers because they did not want to look too ambitious, assertive, or pushy. Single women were much more likely to report having avoided actions for these reasons than were non-single women or men.

—Jen Deaderick



asked to make choices about pairs of hypothetical jobs individually, which would later be discussed with a small group. Membership in the small group was randomized such that some single women had male groupmates, while the remainder had only female groupmates. When placed with female peers, 68 percent of women reported

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