

Education Wage Gap

Julie L Hotchkiss

September 2010

Moderator: *Welcome to Research Insights, an occasional podcast from the Federal Reserve Bank of Atlanta. We're talking today with Julie Hotchkiss, a research economist and policy adviser at the Atlanta Fed, about a recent working paper she co-authored. Her research concerned the wage gap between workers with differing degrees of educational attainment.*

Julie, thanks for joining us today.

Julie Hotchkiss: Thanks, Tom.

Moderator: *Julie, I'd like to start our conversation today by discussing skill-biased technological change, which you discuss in some detail in your paper. What exactly is skilled-biased technological change [SBTC]?*

Hotchkiss: Well, that's a good question, Tom. Skill-biased technological change, or SBTC, is the term used when referring to technological advances that increase the value of more highly skilled workers, or more highly educated workers. It's generally accepted that the advance in computing technology during the 1980s and '90s required a higher-skilled worker to take advantage of the advances in the production process. An example of a technological change that favors lower-skilled workers was the introduction of the assembly line in the early 1900s. This technological change resulted in the replacement of skilled craftsmen with workers requiring very little skill to assemble automobiles, for example.

Moderator: *Right. Julie, there's a debate over the role of skills-biased technological changes as the source of the growing wage gap. What did your research indicate regarding the role of SBTC?*

Hotchkiss: Well, we found that skill-biased technological change has played an important role in the growing earnings differentials between more- and less-educated workers. While many other studies have come to the same conclusion, ours is unique in that it puts the SBTC theory up against other possible explanations for that growing earnings gap. For example, others have hypothesized that declining unionization rates put downward pressure on wages of less-educated workers since less-educated workers are more likely to be employed in occupations that are unionized. We found that declining rates of unionization did put downward pressure on wages of workers with little education, but it was really just a drop in the bucket and its influence was swamped by the impact of SBTC.

Moderator: *OK, right. Well, if the demand for skilled labor increases, causing more people to seek an advanced education, shouldn't that lead to more educated workers and, therefore, a narrowing skill wage gap?*

Hotchkiss: Well, this is the obvious natural consequence of increased rewards going to the college educated. As the demand increases, wages for the college educated are driven up, which increases the incentive of people to attain a college degree. And there's generally consensus that supply is responding to increased demand, but that it's not kept up. Some evidence of the market re-gaining some sort of equilibrium, though, is that the growth in the wage gap between workers with a high school and college degree slowed in the 1990s. The wage gap grew by 12 percentage points in the 1980s, but by just over half of that (7 percentage points) during the 1990s. We have yet to investigate what's happened during the most recent decade, but that investigation should tell us even further whether supply of college workers is continuing to catch up with demand.

Moderator: *That will be interesting. Julie, you've attempted to decompose the composition of groups of workers and how their characteristics translate into wages. What kinds of factors did you look at in this decomposition process, such as immigration, mobility, or unemployment rates?*

Hotchkiss: Well, previous work that investigated what factors might be contributing to the growing wage gap between high school- and college-educated workers typically focused on one or two contributors only. Our primary goal in this paper was to essentially run a racehorse. If measures of all the factors identified by others are included in the same analysis, which one wins? In other words, which factors are most important in explaining the growth in the wage gap?

Some of the factors that we included in this analysis, in addition to changes in technological investments and usage, included the increased immigration of low-skilled workers and decreasing rates of unionization, which I just mentioned—both of which can be expected to put downward pressure on the wages of high school graduates. We also included information about the share of workers in the labor market with the same education level. The presence of a larger number of college graduates, for example, might put downward pressure on wages for all college graduates. As it turns out, college graduates seem to benefit in terms of earnings from a concentration of college graduates in the same labor market. There seems to be a complementarity of skills that generate higher earnings. In other words, the value of the total is greater than the sum of each individual's value. This, however, does not seem to be the case for less-educated workers.

Moderator: *In your paper, you talk a great deal about the role of computers in the wage gap. What sort of effects did computers have on the wage gap over the years, and has this effect varied over time, becoming greater in some decades than others?*

Hotchkiss: Well, the use of computers at work appears to have been the driving force behind the growth in the earnings of college graduates,

relative to high school graduates. Besides just our observation of the growing use of computers in the '80s and '90s, we do have evidence from two different surveys. One survey is from the Bureau of Economic Analysis that reports the expenditures that firms make each year on computer software. This expenditure increased by more than 220 percent in each decade of the 1990s and the 1980s. In contrast, investments in computer software increased by only 131 percent in the 1970s. In addition, the Bureau of Labor Statistics has done some special surveys of workers, asking them whether they use a computer at home or at work. While these figures are not available in the 1970s, we see that the probability of using a computer at work increased from 23 percent in 1980 to 51 percent in 2000, and the figure is much higher among college graduates, of course. Also, while 57 percent of workers used a computer at home in 1990, 81 percent did so in 2000. So you can see that the use of computers has just exploded, which I guess really won't be much of a surprise to anybody.

Moderator: *No, I wouldn't think so. Julie, could you discuss how technology has affected wages of less-educated workers?*

Hotchkiss: Well, any production process requires a mix of skills. As technology allows us to produce more output, demand for all levels of skills increases. Workers with less education who are not directly making use of the new technology are what we call complementary to more educated workers who do use greater and greater amounts of technology. At the same time that the demand for college-educated workers was increasing because firms needed workers to meet their growing use of technology, the demand for less-educated workers was also increasing in order to support the growing output. However, the demand for less-educated workers did not grow quite as fast as that for more educated workers, which is one of the main reasons we see the growth in the gap between wages of these two groups of workers.

Moderator: *Julie, you note in your paper that different decades experienced different rates of growth in the wage gap. Could you summarize what factors give each decade its own character?*

Hotchkiss: Well, technology has had the biggest positive influence on the wage gap in both decades, but in slightly different ways. During both decades the demand from employers and the increased use of computers at work served as the largest influence, pushing wages of college educated workers higher. During the 1990s, employers also increased the value they placed on workers, particularly college workers, using computers at home, which really just means the skills that they brought to the workforce from that use of computers at home. But it was also during the 1990s when the complimentary influence of technological change kicked in, increasing the demand for certain occupations held mostly by high school-educated workers. This effect worked to dampen the boost that college grads got from their increased technology use.

Moderator: *Julie, my last question to you concerns the belief among some segments of the population that immigrant workers have depressed wages for less-educated workers. Did your research find immigrant labor to have much of an effect on the wage gap?*

Hotchkiss: You're right, Tom. Much of the concern in recent years, at least before the most recent recession, has been related to the growth in undocumented immigrants, the majority of whom arrive with very little education. In fact, the number of undocumented immigrants in the U.S. increased by roughly 140 percent during the 1990s and by an additional 40 percent since 2000. This increased supply is expected to put downward pressure on the wages of all low-skilled workers, which would have the impact of increasing the wage gap. We found, however, that compared to the other influences on the wage gap, immigration of low-skill workers contributed very little—an impact less than 2 percent of the size of the impact of technology, for example.

Moderator: *Julie, thanks so much for talking with us today.*

Hotchkiss: You're welcome, Tom. It was my pleasure.

Moderator: *Again, we've been speaking with Julie Hotchkiss of the Atlanta Fed's Research Department. This concludes our Research Insights podcast on the education wage gap. Thanks for listening, and please return for more podcasts.*

If you have comments, please e-mail us at podcast@frbatlanta.org.