

Technology, Unionization, and Income Inequality

BY SETH RUBINSTEIN

During roughly the first half of the 20th century, union membership in the United States consistently rose. In 1900, only 7 percent of the U.S. labor force was in a union, but by 1955, that figure had risen to 32 percent. In roughly the second half of the century, it consistently declined, falling to less than 15 percent by the end of the century. When graphed, this union membership pattern resembles a \cap -shaped, or concave, function.

Meanwhile, during that same period, income inequality in America experienced the opposite trajectory, declining through the first half of the 20th century and rising through the second half. The wealthiest decile of Americans earned 41 percent of income around the beginning of the century; following a \cup -shaped, or convex, pattern, that number declined to a low of 31 percent in the middle of the century, and rose back up to 41 percent by 2000.

Economists Emin Dinlersoz of the U.S. Census Bureau and Jeremy Greenwood of the University of Pennsylvania investigate these trends in a recent paper. Their questions: What caused the \cap -shaped pattern in union membership and the \cup -shaped pattern in income inequality over the 20th century in the United States? And are the two phenomena related?

Dinlersoz and Greenwood hypothesize that skill-biased technological change is the driving force behind both de-unionization and income inequality. In other words, they set out to determine whether technological developments that favor skilled laborers over less-skilled ones can explain declining union membership and rising income inequality. The authors explore the topic in three ways: (1) economic history, (2) a developed model, and (3) statistical tests on empirical data. After building an intuitive grasp of the story from the historical perspective, they ultimately find their hypothesis supported by the data.

Historical context offers an intuitive explanation for these trends. As the early 1900s brought the assembly line, the relative productivity of unskilled laborers increased. With that came greater unionization and lower income inequality. Roughly the second half of the century, however, saw the reversal of this trend. With the advent of more sophisticated and inexpensive automation, eventually including computers, the work of many less skilled laborers could be outright replaced by machines. Skilled laborers were needed to work with the new, sophisticated technology. With these developments came less unionization (because of lower demand for less skilled laborers,

displaced by machines) and more income inequality (because only those with training that equipped them to work with new technology could really benefit from the new skill-biased technological developments.)

With this economic history in mind, Dinlersoz and Greenwood build a model of unionization to see if, in fact, the variable of skill-biased technological change can explain the \cap - and \cup -shaped phenomena. Their model assumes that unions value two things: maximizing wages for union members, and maximizing the number of firms organized with unions. Importantly, however, that generally entails a trade-off between the two goals. Through simulations, the authors find that the model supports their hypothesis that skill-biased technological change is associated with de-unionization and rising income inequality.

The authors go on to examine whether the empirical evidence supports their model. They look at two factors. One is whether skill-biased technological change and the

skilled to less-skilled labor ratio are positively correlated — that is, whether an increase in one is associated with an increase in the other. The second is whether skill-biased technological change and the unionized share of the workforce are negatively correlated. If both of these correlations are borne

out in the data, that would support their hypothesis.

To measure skill-biased technological change, Dinlersoz and Greenwood look to the relative prices of new capital goods. Specifically, they use a database of prices over time taken from the work of economists Jason Cummins, now at Brevan Howard Asset Management, and Giovanni Violante of New York University, who in 2002 calculated quality-adjusted relative prices of new capital goods in equipment and software. “The idea is that technological progress is embodied in the form of new capital goods. Technological progress in the capital goods sector is reflected by a declining relative price for investment,” Dinlersoz and Greenwood write. “Industries where the price of the capital inputs drops the quickest should experience the fastest pace for skill-biased technological change.”

The data, it turns out, support the hypothesis that skill biased technological change can be a force behind de-unionization and increased income inequality. With income inequality generally rising and technology becoming ever more sophisticated and important to the economy, better understanding these relationships could help the United States prepare for labor trends on the horizon. **RF**

“The Rise and Fall of Unions in the U.S.”

Emin M. Dinlersoz and Jeremy Greenwood. National Bureau of Economic Research Working Paper No. 18079, May 2012.