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# ASSESSING THE JOB POLARIZATION EXPLANATION OF GROWING WAGE INEQUALITY

BY LAWRENCE MISHEL, JOHN SCHMITT, AND HEIDI SHIERHOLZ

*This EPI Working Paper is the introduction from Assessing the Job Polarization Explanation of Growing Wage Inequality, a draft paper presented at the "Inequality in America: Contending Theories" panel at the 2013 annual meeting of the Allied Social Science Associations, Jan. 4–6, 2013. The completed, full paper will be available in a few weeks.*

A relatively recent body of work has elaborated a new explanation of growing wage inequality that is based on changes in job tasks in the economy and the resulting shifts in occupational employment. We refer to this as the “Job Polarization” approach, or as a “jobs-task” analysis. This approach started with Autor, Katz, and Kearney (2006), and the most elaborated version has appeared in Acemoglu and Autor (2011 and 2012). A relatively popularized version is presented in Autor (2010). The Job Polarization approach consciously attempts to build on what they refer to as the canonical model of skill-biased technological change (SBTC), based on two types of workers, college and non-college, that has been used to explain the wage inequality of the 1980s (Katz and Murphy 1992). The canonical model fails to explain important wage trends in the 1990s, and Job Polarization attempts a more general analysis based

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on job tasks that subsumes the canonical model and claims to be able to explain the 1990s wage trends and, in fact, all wage inequality trends of recent decades. This interpretation of growing wage inequality has had a large presence in the public discussion of inequality and in policymaking circles, at least on the center-left. In this paper we undertake to empirically assess whether the Job Polarization approach can explain key wage inequality trends since 1979.

We identify several empirical claims made by the Job Polarization approach, but the two keys ones are:

*Claim 1: In the 1990s, employment growth was polarized, with the employment share of high-skilled and low-skilled occupations expanding and the employment share of middle-skilled occupations contracting. This pattern marked a stark change relative to the 1980s when, across occupational skill levels, employment grew least at the bottom, more in the middle, and most at the top. Service occupations play a particularly important role in driving this employment polarization. Note that proponents of the tasks model find no evidence of, and make no claims about, the existence of job polarization in the 2000s.*

*Claim 2: This switch in occupational employment patterns in the 1990s yielded three shifts in wage patterns: (a) after wage inequality increased symmetrically at the top and the bottom of the distribution in the 1980s, wage inequality in the 1990s was distinctly asymmetric around the mean, with growing inequality in the top half (90/50 wage gap) of the distribution and declining inequality in the bottom half (50/10 wage gap); (b) from the early 1990s, education wage differentials stabilized among the non-college educated (that is, those with some college, a high school degree, or no high school degree); and (c) from the mid-1990s, the college premium decelerated sharply and grew at a rate well below what would have been predicted by the canonical model.*

If the first claim is essentially “job polarization occurred in the 1990s but not in the 1980s,” then the second claim is that “the change in occupational employment patterns in the 1990s to job polarization in the 1990s explains changes in key wage patterns.”

We summarize our main findings as: (1) the job polarization approach does not accurately describe changes in occupational employment trends in the 1990s relative to the 1980s. We affirm the Acemoglu and Autor (2011, 2012) finding that occupational employment shifts in the 2000s were not “polarized”; and (2) occupational employment trends have not shaped key wage patterns in the last two decades, contrary to the claims made by the job polarization approach. Computerization and changing technology has had significant impact on the evolving composition of occupational employment in the last few decades; however, we document that occupational upgrading (shrinkage of middle-wage occupations and a corresponding expansion of high-wage occupations) has been an ongoing process for at least six decades, including ones where wage inequality declined and median real wages grew. Technological change has generated changes in the job structure and the need for greater skills and education but has not been responsible for growing wage inequality or the divergence of productivity and median real wage growth that has characterized the post-1979 period. We offer an explanation of these trends that does not rely on technological change as a factor, an explanation that highlights shifts in power in the labor market driven by policy changes.

A more elaborated view of the key findings in this paper is:

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## On Job Polarization and occupation shifts

- There is nothing new about occupational upgrading, that is, the expansion of high-wage occupations and the diminution of middle-wage occupations. This process has been ongoing since 1950, as documented in Acemoglu and Autor (2011) and Autor and Dorn (2012). Middle-wage jobs contracted at the same pace in the 1980s, 1990s, and 2000s. This occupational upgrading occurred during both times of rising median real wages with stable or falling wage inequality, and during falling real median wages with growing wage gaps between the top and the middle. This suggests that occupation shifts are not drivers per se of recent wage problems in the middle. It also suggests, as Autor and Dorn (2012) state, that the veracity of the “job polarization” (JP) framework relies heavily on trends in low-wage service occupations.
- Changes in service occupations (the low-wage occupations in the job tasks analysis) from decade to decade have not been large enough to affect key measures of wage inequality, such as the 50/10 wage gap. Nor have the changes necessarily been in the direction that could explain movements in the 50/10 wage gap. Moreover, the failure to account for occupation coding changes in the 2000s artificially doubles the service occupations’ expansion in the 2000s.
- The finding of job polarization trends is not robust. Most importantly, these trends have never been subjected to a test for goodness-of-fit. Fitting a regression (across each percentile) to match the smoothed occupation employment share changes presented in the job tasks literature shows that the smoothed lines are not a sturdy representation of the underlying data. We obtain adjusted R-squared as follows: 1979–1989, 0.015; 1989–2000, 0.176; and 2000–2007, 0.042. Data discontinuities due to occupation coding changes mar the analysis of occupation employment trends in the 2000s, but not in the 1980s. Changing the ranking of occupation from mean wages to median wages alters important findings, such as whether low-wage occupations expanded absolutely or just relatively in the 1990s.
- We have also pointed out that occupational job polarization did not occur in the 2000s, which leaves a job tasks analysis, at best, a theory developed to explain the 1990s that is unable to explain wage trends in the 2000s. The evidence presented in Autor (2010) and Acemoglu and Autor (2011, 2012) show no increase in the employment expansion of high-wage relative to low-wage occupations; this means that an occupation-based analysis cannot account for a rising 90/50 wage gap in the 2000s. Moreover, the faster expansion of low-wage occupations in the 2000s (which increases relative demand for low-wage workers), compared to other periods, is inconsistent with the *expansion* of the 50/10 wage gap for men and women. Job task analysis proponents fail to acknowledge how problematic the 2000s are for their analysis.

## Do occupation shifts shape wage patterns so as to drive wage inequality?

- Proponents of job tasks analysis have not offered *direct* evidence of how occupation shifts shape wage patterns; rather, the evidence presented merely shows that when job polarization occurred in the 1990s there was also a polarization of wages (the 90/50 gap expanding and the 50/10 gap closing).
- The impact of occupation employment shifts can be challenged based on the timing and the impact of occupation shifts on wages (the scale of the shifts and the degree to which such shifts affect wages). All the results are foretold by noting that occupation shifts are rather continuous over the 1979–2007 period but changes in wage gaps are discontinuous, particularly those of the 50/10 wage gap. Continuous trends cannot explain discontinuous trends.

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- We examine the link between occupational employment shifts in two ways. First, we examine the *direct* role of occupation shifts on (a) wages and wage inequality; and (b) 90/50 and 50/10 wage gaps. Second, we examine *channels* through which occupation employment shifts are expected to affect wages: occupation wage differentials and education job requirements.
  - We do not find the *direct* role of occupation employment shifts on wages imagined by the job tasks analysis. We estimate the impact of occupation shifts on wages using 320 detailed occupations in a wage regression. We find, contrary to job task analysis claims, that occupation employment shifts were less important in the 1990s than in the 1980s. Moreover, occupation shifts can account for only half the overall growth of wage inequality between 1979 and 2007 and less than a third of wage inequality trends more recently, from 2000 to 2007. Thus, contrary to job task analysis, occupations cannot explain wage inequality or even the vast majority of wage inequality and are not increasing their importance in wage determination over time. Our estimates of occupation shifts on key wage gaps find occupation variables to be statistically insignificant, frequently with the wrong sign, and not of the magnitude to explain the trends.
  - We do not find the *channels* through which occupation employment shifts are expected to affect the wage distribution to be consistent with the job task analysis. The most important results compare, within each time period: (a) employment growth by occupation percentile (ranked by mean occupational wages); (b) wage growth across occupation percentile (using the same ranking scheme); and (c) wage growth across wage percentiles of the overall distribution. According to the jobs task approach, these three trends should be consistent; occupation employment shifts should drive occupation wage shifts which, in turn, should drive overall wage shifts. The trends we observe, however, are frequently inconsistent with this chain of effects and, in fact, differ in important ways from the jobs task predictions. In the 1980s, observed occupation employment shifts are consistent with wage equalization, which did not occur, and the growth of occupational wage differentials are far more muted than they are for overall wages. In the 2000s, occupational employment shifts are consistent with a contraction of occupational wage differentials in the bottom half, but the overall wage distribution became more unequal in the bottom half. The presumed mechanisms by which occupational employment shifts affect wages do not operate as imagined in the job tasks analysis.
  - As Acemoglu and Autor (2011, 2012) note, the canonical model implies that the relative demand for college graduates decelerates after 1992, which “does not accord with common intuitions regarding the nature or pace of technological changes occurring in this era” (Acemoglu and Autor 2011, 2012). In fact, occupation-driven estimates of relative demand for college graduates (or “college equivalents”) are totally consistent with a deceleration of relative demand. The “common intuition” is not supported by the data and the clear implications of Acemoglu and Autor’s analysis. This, along with other findings, suggests that technological change has been adverse for important segments of college graduates and the average college graduate since the early or mid-1990s.

This paper makes several empirical contributions to the overall wage inequality literature and, particularly, to the examination of occupational employment trends:

- Our analysis provides a new source of data, the Current Population Survey (CPS), to the analysis of occupational employment trends;
- The use of the CPS allows us to examine *annual* occupational employment trends, which have previously not been examined;

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- The use of annual data allows us to identify and assess the mismeasurement due to discontinuities resulting from occupation coding changes in 1983 and 2003. These discontinuities are still evident in the data even though employment trends are measured with “consistent” detailed occupation crosswalks; and
  - Our analysis examines the goodness-of-fit of the smoothed lines used to describe job polarization trends.

## ***Explaining wage inequality without SBTC***

We offer an explanation of rising wage inequality since 1979 that includes no role for SBTC. Rather, SBTC is seen as generating the ongoing occupational upgrading and associated greater employer needs for more educated and skilled workers, an upgrading that has been present in the economy for many decades. In our view, the substantially increased need for education and skills has been met by the increased supply of education and skills.

Changing wage differentials have been driven by economic policy in acts of omission and commission. While the canonical model focuses on two types of workers (more- and less-educated, usually operationalized as college- and non-college-educated) and the newer task-based models focus on three types of workers (low-, middle-, and high-skilled workers performing routine and non-routine cognitive and manual tasks), our explanation concentrates on workers at four key points in the wage distribution: the bottom (10th percentile), middle (50th percentile), top (90th percentile), and the very top (the 95th to 98th percentile and above).

Our explanation emphasizes that, over each of the last three decades, different policies, ranging from macroeconomic (fiscal, exchange rate, and monetary policies that affect unemployment and trade) and trade policy to financialization and those policies affecting institutions and particular sectors (unionization, the minimum wage, trade policy, deregulation, etc.) had different effects on workers at each of the four points in the wage distribution. Given the different timing and size of wage changes for men and women at each of these four points in the respective wage distributions, we pay particular attention to the fact that the importance of some institutions differed significantly by gender.

By contrast, the canonical SBTC model and the newer task-based models seek to explain all or the majority of the rise in wage inequality without appealing to any of the macroeconomic, policy, or institutional factors we cite. The job polarization analysis does not even attempt to explain one of the key wage developments: the dramatic rise of the earnings of the top one percent. The formal models—see Acemoglu and Autor (2011)—include no role for these factors, leaving all of rising inequality to be explained solely by technological change and individual decisions about skills acquisition. Curiously, many of the proponents of SBTC (in the canonical and more recent forms) make important contributions in the analysis of other factors that we believe play a key role in generating wage inequality: globalization (Autor, Dorn, and Hanson forthcoming; Borjas, Freeman, and Katz 1992); the minimum wage (Katz and Krueger 1992; Autor, Manning, and Smith 2010); macroeconomic policy and unemployment (Katz and Krueger 1999); and other institutional factors. But, these factors are set aside and seen as minimally important relative to the underlying supply and technologically driven demand dynamics whenever some version of SBTC is assessed. We don't deny that technological factors play a large role in the labor market. Our argument is that they have not played much of a role in the rise in wage inequality. Existing SBTC models, which ignore policy and institutions, are too narrow to explain trends over the last 30 years. We also note that even absent a strong role for SBTC in generating wage inequality, there remain important roles for education and training policy to generate economic growth, increase social mobility, and overcome historic deficiencies in skills and education in disadvantaged populations, deficiencies that were prevalent in the 1970s.

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## Policy implications

In our view, the policy pronouncements of either school of SBTC thought are not consistent with their own findings. In particular, both schools stress the need to greatly expand college completion. The canonical model, however, shows a sizable deceleration in the relative demand for college graduates starting around 1992. The job task analysis shows no increase in relative demand for high-wage occupations relative to middle-wage occupations in the most recent business cycle, 2000–2007, and occupation-driven employer requirements for college graduates decelerated in the 1990s. Both of these findings help explain why college graduate wages and benefits have been relatively stagnant for ten years and the wages and benefits of entry-level college graduates have fallen. It goes unstated that sharp increases in college completion will result in falling college wages, especially among men and young college graduates.

### What economists mean by ‘technology’ when they say technological change causes wage inequality

When economists talk about technological change and its role in generating wage inequality, they sometimes are talking past the general public, who may not understand what is being discussed. In their analysis economists are referring exclusively to technology in its role in shaping how goods and services are produced and the consequent implications for what types of workforce skills are required. Autor, Katz, and Kearney (2008, footnote 17) say this clearly, writing, “Skill-biased technological change refers to any introduction of a new technology, change in production methods, or change in the organization of work that increases the demand for more-skilled labor relative to less-skilled labor at fixed relative wages.”

“Technology” in this usage does not include technology’s impact on communication or transportation costs and the consequent implications for where production takes place. (This dynamic falls under offshoring and globalization as a driver of wage inequality.) Nor does “technology” in this usage include changes in the products or services themselves, such as new gadgets that improve our well-being. (These affect the relative demand for various goods and services but not how things are produced.)

As Mishel et al (2012, 295) note:

“We are often told that the pace of change in the workplace is accelerating, and technological advances in communications, entertainment, Internet, and other technologies are widely visible. Thus it is not surprising that many people believe that technology is transforming the wage structure. But technological advances in consumer products do not in and of themselves change labor market outcomes. Rather, changes in the way goods and services are produced influence relative demand for different types of workers, and it is *this* that affects wage trends. Since many high-tech products are made with low-tech methods, there is no close correspondence between advanced consumer products and an increased need for skilled workers. Similarly, ordering a book online rather than at a bookstore may change the type of jobs in an industry—we might have fewer retail workers in bookselling and more truckers and warehouse workers—but it does not necessarily change the skill mix.”

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— **Lawrence Mishel** has been president of the Economic Policy Institute since 2002. Prior to that he was EPI's first research director (starting in 1987) and later became vice president. He is the co-author of all 12 editions of *The State of Working America*. He holds a Ph.D. in economics from the University of Wisconsin-Madison, and his articles have appeared in a variety of academic and non-academic journals. His areas of research are labor economics, wage and income distribution, industrial relations, productivity growth, and the economics of education.

— **John Schmitt** is a senior economist with the Center for Economic and Policy Research in Washington, D.C. He has written extensively on economic inequality, unemployment, the new economy, the welfare state, and other topics for both academic and popular audiences. Schmitt has co-authored (with Lawrence Mishel and Jared Bernstein) three editions of *The State of Working America*. Schmitt has a Ph.D. in economics from the London School of Economics.

— **Heidi Shierholz** joined the Economic Policy Institute as an economist in 2007. She does research on employment, unemployment, and labor force participation; the wage, income, and wealth distributions; the labor market outcomes of young workers; unemployment insurance; the minimum wage; and the effect of immigration on wages in the U.S. labor market. She previously worked as an assistant professor of economics at the University of Toronto, and she holds a Ph.D. in economics from the University of Michigan-Ann Arbor.

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