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Does Inequality Increase Productivity?

Evidence From U.S. Manufacturing Industries, 1979 to 1996

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Wage inequality was investigated using the Current Population Survey combined with data on industrial productivity from the Center for Economic Studies of the U.S. Census Bureau. The research objective was to estimate the net effect of wage inequality on productivity in U.S. manufacturing industries from 1979 to 1996. Using fixed-effects panel models that control for unobserved differences in productivity across these industries, the results do not support the skill-biased technological-change argument, which assumes that increasing wage inequality has enhanced productivity in recent decades. In contrast, results from the regression analyses in this study clearly indicate that wage inequality has not had a positive net effect on productivity. Interpretation of these results suggests that organizational restructuring associated with the New Economy has increased labor market inequality but is less associated with increasing efficiency than is commonly assumed.

Keywords: *productivity; inequality; skill-biased technological change*

By all accounts, aggregate wage and income inequalities have been steadily increasing in the United States since the 1980s (Autor, Katz, & Kearny, 2006; Card & DiNardo, 2002; Gottschalk, 1997; Jencks, 2002; Kalleberg & Mouw, 2006; Levy, 1998; Morris & Western, 1999; Piketty & Saez, 2003). Some researchers further contend that workers near the bottom of the

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distribution have suffered reduced economic mobility and stagnation (or even a decline) in the real value of their wages (Bernhardt, Morris, Handcock, & Scott, 2001; Gottschalk, 1997; Levy, 1998; Morris & Western, 1999; Schmitt, 2001). When combined with the trend toward increasing earnings for workers near the top of the distribution (Autor et al., 2006; Kalleberg & Mouw, 2006; Piketty & Saez, 2003), these changes actually lend some credence to the old adage that *the poor get poorer and the rich get richer*.

We concur with previous researchers who argue that this trend has had deleterious consequences for American society (American Political Science Association, 2004; Burtless & Jencks, 2003; Krugman, 2002; Neckerman, 2004). The idea of “two Americas”—polarized into rich versus poor—was even a major theme in the 2004 U.S. presidential campaign and is likely to remain a significant political issue (Alter, 2005; Bartels, 2006; Slevin, 2005). Although sociologists have not until recently focused extensively on attempting to explain this trend (DiPrete, 2005; Kalleberg & Mouw, 2006; Kim & Sakamoto, in press; J. B. Sørensen, 2007; Weeden, Kim, Carlo, & Grusky, 2007), further research on the sources of increasing wage dispersion is critically important both in terms of advancing sociological knowledge as well as public policy debates regarding the nature of rising inequality in America.

In this article, we analyze productivity in U.S. manufacturing industries from 1979 to 1996. We seek to estimate the effect of increasing wage inequality on industrial productivity over this period. Our concern here is not to focus on the social costs and ramifications of inequality but to investigate whether increasing inequality improves efficiency and productivity, which seems to be a commonly held view. Assumptions about the latter are at least implicit, for example, in the official platform statement of the Republican Party, which argues that free markets and reduced taxes improve economic growth (Republican National Committee, 2004). A more academic statement of this view is provided by Welch (1999), who argues that rising inequality during the past three decades has promoted rising average incomes including those for minorities and women. To the extent that increasing inequality has indeed improved productivity, then this relationship would need to be considered as a relevant issue in our understanding and evaluation of proposals to reduce the growth of inequality.

Skill-Biased Technological Change and Rising Inequality

One of the best-known explanations of the trend of increasing inequality is the argument that has come to be known as skill-biased technological

change (SBTC) that has been popular in economics (Atkinson, 1999; Card & DiNardo, 2002). According to this view, recent technological developments have increased the demand for high-skilled workers but have decreased the demand for low-skilled workers. As a result of the increased demand for high-skilled workers, the economic returns to advanced work skills, ability, education, and cognitive capacities have increased (Atkinson, 1999; Autor & Katz, 1999; Bound & Johnson, 1992; Card & DiNardo, 2002; Gottschalk, 1997; Herrnstein & Murray, 1994; Juhn, Murphy, & Pierce, 1993; Levy, 1998; Levy & Murnane, 1992; Murphy & Welch, 1993). Although high-skilled workers are now earning more than before, the wages of low-skilled workers are not increasing in real terms because of reductions in the demand for workers who lack sophisticated or technical work skills. This change in the demands for workers' skills is said to have resulted in increased wage inequality in recent decades (Autor et al., 2006; Card & DiNardo, 2002; Levy, 1998).

The SBTC hypothesis is popular among economists because it is inherently compatible with their view of the labor market as highly competitive in that it pays workers according to both the scarcity of their supply and their contributions to productivity (i.e., marginal revenue products; Granovetter, 1981). Unlike sociological perspectives that emphasize institutional forces that shape, intervene, or disrupt competitive market processes (Kalleberg & Berg, 1987; A. B. Sørensen & Kalleberg, 1981), the SBTC view explains increasing inequality in terms of the traditional economic framework of supply and demand. No sociology or ad hoc theoretical innovation is required to understand increasing wage inequality, thus implicitly confirming the usefulness of conventional economics.

In terms of its relation to sociological theory, the SBTC view seems inherently consistent with the functionalist view as formulated in the classic statement of that approach (Davis & Moore, 1945). The claim that high-skilled workers are rewarded with higher wages for their abilities and work skills implies that these workers are being paid more because of their greater contributions of productivity. This contention directly relates to Davis and Moore's (1945, p. 243) idea of "functional importance," which resembles what economists refer to as the demand side of the market (Simpson, 1956). Furthermore, Davis and Moore's (p. 244) discussion of the "differential scarcity of personnel" resembles what economists refer to as the supply side of the market (Simpson, 1956) and is consistent with the basic SBTC assumption that high-skilled workers are scarce because of difficult training or unusual talents.

The implication of both the SBTC view and the functionalist explanation is that if the level of wage inequality were significantly reduced (e.g., by

imposing political administrative control or higher income taxes) then productivity would decline because of the consequent inefficiencies that would be created.¹ The significance of this general issue of excessively restraining economic inequality was forcefully described by Lenski (2001) in his analysis of former socialist societies. Lenski argues that in those societies where profit and wage inequalities were extraordinarily constrained, productivity declines were so severe that the political legitimacy of those regimes was seriously eroded leading eventually to their end. For capitalist economies, the idea that greater income equality reduces productivity was popularized by Okun's (1975) analysis of equality and efficiency as representing the big trade-off in which a leaky bucket characterizes governmental attempts to redistribute incomes.

A critique of the SBTC view and the general microeconomic commendation of free market competition was provided by Bernstein and Mishel (2001). They argue that the SBTC view does not adequately explain: the timing of the recent rise in inequality and technological change, period and cohort differences in the returns to college educational attainment, limited econometric evidence that the increases in the effects of education and labor force experience can explain rising wage inequality, and the recent slowdown in the growth of white-collar occupations. Although evaluating these criticisms is beyond the scope of our analysis, Bernstein and Mishel's arguments do underscore the contention that, although *some* degree of inequality is undoubtedly inevitable for a modern economy, whether the recent *large increases* in inequality are actually associated with productivity gains remains an open question.

Perhaps most relevant to our research concern here is what Bernstein and Mishel (2001, pp. 419-421) refer to as the "productivity paradox." Referring to aggregate data on productivity for the period from 1959 to 1997, Bernstein and Mishel argue that the 1980s and 1990s were not characterized by a notably high rate of productivity growth. The SBTC argument suggests, however, that technological changes in recent decades have accelerated promoting increasing productivity that is associated with rising wage inequality due to higher wages for high-skilled workers and declining demand for low-skilled workers. The problem with this explanation, as pointed out by Bernstein and Mishel, is that productivity growth has not been particularly high in recent decades despite very large increases in inequality. Because of the theoretical significance of this issue, our empirical analysis below develops a more thorough multivariate investigation of the relationship between productivity and wage inequality.

Organizational Restructuring and the New Economy

The recent growth in wage inequality coincides with institutional changes in the American economy. Although different researchers emphasize slightly different aspects of these changes, there appears to be relatively widespread agreement that the American economy has entered a new phase since the 1980s (Acemoglu, 2002; Autor et al., 2006; Berg & Kalleberg, 2001; Budros, 1997; Cappelli, 2001, 2006; Card & DiNardo, 2002; Cornfield & Fletcher, 2001; DiPrete, 2005; Dunne, Foster, Haltiwanger, & Troske, 2004; Frenkel, 2003; Hollister, 2004; Jacoby, 2001; Kalleberg, 2003; Lindbeck & Snower, 2000; Meyer, 2001; Zuckerman, 2000). This new state of the American economy is often described as involving changes that may include increased globalization in production, marketing, and competition; greater price competition; advances in the use of technology in the workplace, especially those involving information (i.e., computers); organizational restructuring to reduce managerial hierarchies, cut costs, shift greater risk to workers, and promote greater flexibility in the employment of labor; declining unionization; increased nonstandard work arrangements and part-time employment; the decline of employment security and of traditional internal labor markets; greater teamwork and multitasking among workers and among core workers; increased competition in capital markets and heightened concerns for shareholder demands for higher profits; reduced organizational commitment among workers; and the increased use of subcontracting, outsourcing, and the downsizing of employment. These sorts of changes are typically referred to in descriptions of the rise of the New Economy.

Although both economists and sociologists acknowledge these changes, economists tend to view them in the context of their general neoclassical theory, according to which changes in technology and firm organization are driven by competitive market forces to yield more efficient and productive work arrangements. That is, for economists, the New Economy is presumed to yield greater productivity and efficiency given the current technological and market (including international trade) conditions. This interpretation of the New Economy is compatible with the SBTC explanation of rising inequality because both views emphasize the importance of market competition and technological changes that increasingly force employers to reduce unnecessary costs in their operations because of greater price competition, heightened globalization, and more competitive capital markets.

For example, economists explain the downsizing of middle-level white-collar jobs as resulting from the efficient substitution of computerized

technologies that can more cheaply perform routine cognitive tasks and thereby reduce the demand for bookkeepers, accountants, and lower-level managers (Autor et al., 2006). Declining unionization can be similarly explained by the standard neoclassical economic view that competitive pressures drive out inefficiencies including unions that foster outdated pay policies and production processes leading to lower productivity and higher costs (Pindyck & Rubinfeld, 2001, pp. 523-528). The increase in part-time workers is said to reflect the preferences that workers have for flexible employment to meet their family and nonwork activities (Blank, 1998).

In contrast to economists, however, sociologists are less presumptuous that the New Economy can be simply described in terms of greater efficiency (Budros, 1997; Davis, Diekmann, & Tinsley, 1994; P. M. Hirsch & Soucey, 2006; Zuckerman, 2000). Rather than being understood solely in terms of enhancing productivity, sociologists interpret labor market changes as deriving from conflict over control of the production process and over the distribution of the economic surplus (Granovetter & Tilly, 1988). As argued by P. M. Hirsch and Soucey (2006, p. 179), the view that organizational restructuring improves efficiency is often more assumed than demonstrated because “the positive impact of these changes on higher levels of productivity has not been proven” (Gordon, 1996; Gowing, Kraft, & Quick, 1997; Harrison & Bluestone, 1988). P. M. Hirsch and Soucey (p. 171) conclude that the efficiency gains of the New Economy may be more rhetorical than actual because “the language of restructuring is regularly used to mask, reframe, and sugarcoat economic slumps as possessing positive social outcomes.”

Organizational restructuring and other institutional changes associated with the rise of the New Economy at least partially reflect power differentials between social groups or individuals rather than deriving from a Pareto-optimal, competitive equilibrium of the sort envisioned in economists’ conceptualization of economic efficiency (Pindyck & Rubinfeld, 2001). Thus, the downsizing of middle-level occupations and lower-level managers reflects not simply the development of advanced computerized technologies but also struggles over power and the control of organizational processes in a new era in the “social structures of capitalist accumulation” (Wallace & Brady, 2001, p. 102). Similarly, the role of power differentials is undoubtedly evident in declining unionization rates (Cornfield & Fletcher, 2001). Unionization is to some extent influenced by power differentials as expressed and legitimated by political institutions in the workplace or in governmental processes (Clawson & Clawson, 1999; Cornfield & Fletcher, 2001). Declines in unionization have led to greater wage and earnings inequalities (Nielsen & Alderson, 2001) that therefore at least partly implicate complex

political processes rather than representing some inexorable technological trend driven by putatively competitive economic forces (DiPrete, 2005). In fact, different labor market institutions in Europe and the United States are compatible with similar rates of growth (Lindert, 2004).

The increase in part-time employment and nonstandard work arrangements has raised wage and earnings inequalities (Kim & Sakamoto, *in press*; Nielsen & Alderson, 2001). However, as discussed by Mishel and Bernstein (1995) and Cappelli (2001), the majority of part-time workers prefer to be employed full-time. Although management often uses contingent work, part-time employment, and subcontracting to reduce labor costs and increase employment flexibility, workers who are placed into this situation are usually not choosing it voluntarily but are rather more vulnerable and lack bargaining power within the firm (Cappelli, 2001; P. M. Hirsch & Soucey, 2006; Kalleberg, 2001; Mishel & Bernstein, 1995). In other words, this source of inequality increases profitability for companies but it probably does not reflect a fully competitive bargaining process over who gets full-time employment and who does not. Efficient market competition may be therefore less of a fundamental factor in increasing part-time employment than power differentials among workers.

There is also evidence of a general decline in internal labor markets. As stated by Cappelli (2001, p. 207), "internalized employment arrangements that buffer jobs from market pressures are giving way to arrangements that rely much more heavily on outside market forces to manage employees." As argued by Cappelli (p. 228), workers typically have an "inverted U" pattern to their productivity, and internal labor markets have traditionally set wages to "generally smooth over these variations in performance, so that new entrants and older workers are paid much more than their productivity while midcareer workers are paid less. Recent evidence suggests a reversal in these practices." Thus, the decline in internal labor markets represents an organizational change that has increased wage inequalities, but this restructuring "raises questions for sociologists of work about fundamental shifts in the distribution of power and authority in the organization" (P. M. Hirsch & Soucey, 2006, p. 181).

In sum, organizational restructuring in the New Economy has been interpreted by economists to be associated with increased productivity due to greater market competition and SBTC. Although not totally dismissing the relevance of those factors, sociologists have pointed out that institutional changes do not solely derive from market competition but also reflect power differentials between various social groups. The sociological perspective recognizes that market competition operates within a complex social context

(Granovetter, 1985; Smelser & Swedberg, 1994; A. B. Sørensen & Kalleberg, 1981; Tumin, 1953) such that economic outcomes derive not simply from technological innovations and the equilibrium of competitive market exchanges but are instead influenced by the uneven distribution of power between the persons implicated in these exchanges. The implication of the sociological approach is that increases in inequality may actually reflect increased segmentation in the labor market and may not increase productivity, contrary to the SBTC explanation.

Prior Research on the Relationship Between Wage Inequality and Productivity

The link between wage inequality and workforce productivity has been generally discussed in the literature on Japanese management practices. For example, Takeuchi (1985) argues that productivity involves significant collective effort on the part of a firm's workforce and that an excessive degree of wage dispersion will incur the costs of reduced cooperative effort and morale if the inequality generates ill feelings, jealousies, and relative deprivation among workers. Some reduction in intrafirm wage inequality is therefore said to promote collective cooperative efforts such as the training of junior workers by senior workers, the facilitation of on-the-job training, and greater flexibility in job assignments—all of which are characteristic of larger Japanese firms (e.g., Aoki, 1988; Koike, 1983; Shimada, 1985; Tokunaga, 1984). A recent study of a Japanese automobile manufacturing company found that its plant in America had 10% lower productivity than its Japanese plant despite the use of nearly identical technology (Shibata, 2001). This result is consistent with Takeuchi (1985) because Japanese firms tend to have significantly greater intrafirm wage equality than American firms (Lincoln & Kalleberg, 1990; Sakamoto & Chen, 1993).

As for American analyses, Frank and Cook (1995) argue that increased competition in the New Economy has led to labor market processes that overemphasize the relative rankings of workers creating a "winner-take-all society." Disproportionate rewards for the small percentage of workers who rank near the top of their occupations lead to wasteful investments and the misallocation of resources. For example,

the overcrowding problem in winner-take-all markets arises because participation in these markets is misleadingly attractive to individuals. . . . To the extent that most of society's top earners are participants in winner-take-all

markets, it follows that a more progressive tax structure would not reduce but actually increase economic efficiency!

In sum, according to Frank and Cook (1995) increased income equality does not necessarily lower productivity and may even increase it.

To our knowledge, prior studies have not systematically investigated firm-level productivity and intrafirm wage inequality using a representative sample of firms.² Similar issues are considered, however, by Freeman and Medoff (1984) in their analyses of the union and nonunion sectors in the United States. They find that, relative to the nonunion sector, the distribution of wages is less dispersed in the union sector. They argue that this result derives from unions as “political institutions whose policies reflect the preferences of average workers” (p. 79). That is, Freeman and Medoff attribute this reduction in inequality to the preferences of unionized workers and their ideas about the fairness and appropriateness of the wage distribution.

Freeman and Medoff (1984, p. 169) conclude that “most studies of productivity find that unionized establishments are more productive than otherwise comparable nonunion establishments.” The authors state that a substantial portion of this productivity growth derives from improved “industrial relations climate” and “more rational, professional management” (p. 163), which is linked to lower quit rates, reduced training costs, and lower rates of grievances filed (see also Norsworthy & Zabala, 1985, for similar conclusions). Although Freeman and Medoff do not explicitly relate this improved productivity to reduced wage inequality per se, the link seems plausible given the considerations discussed above as well as an additional literature on the effects of relative deprivation in pay on reducing productivity (Akerlof & Yellen, 1990; Liu & Sakamoto, 2005).

At a more macroanalytical level, few cross-national studies have investigated patterns of income inequality and economic growth. These economic analyses suggest a negative long-run relationship between income inequality and subsequent growth in per capita income across nations (e.g., Alesina & Perotti, 1994; Clarke, 1995; Perotti, 1996; Persson & Tabellini, 1992). This pattern may derive from the excessive market segmentation that is associated with greater income inequality as well as from indirect positive effects of equality on production by way of human capital development. Reduced inequality may allow poor people to invest more in human capital, which may in turn lead to a reduction in crime and welfare participation or promote more informed political decisions (Krueger & Lindahl, 2001).

We are aware of only one study that has investigated the relationship between wage inequality and productivity at the industrial level in a single

country using multivariate statistical analysis. Liu and Sakamoto (2005, p. 331) analyze data for Taiwan from 1979 to 1995 and find that greater levels of wage inequality in manufacturing industries in a given year were not associated with increased productivity in the subsequent annual period net of other factors. The estimated net effect was actually slightly negative although it was not statistically significant.

In sum, the equality–efficiency trade-off noted earlier (Okun, 1975) has served as the theoretical backdrop for traditional microeconomic analysis that typically views increases in equality as disruptive of the competitive forces of markets and therefore detrimental to productivity and economic growth. In contrast, other research by institutional economists and sociologists suggests that increases in equality may not reduce productivity significantly because of various mitigating factors that enhance other aspects of production either at the firm level or some higher unit of analysis. Because of a general sparseness in prior empirical research on the relationship between inequality and productivity, further studies of this topic are needed.

Methodological Issues and Procedures

A limitation of cross-national studies is that they often make use of data for which the variables are measured slightly differently across nations. This variability has the effect of measurement error that leads to attenuation bias whereby the estimates of coefficients in a regression model are biased downwards (Forbes, 2000; Lloyd-Ellis, 2003). In the following analysis, we seek to avoid concluding that measured inequality has no effect on increasing productivity if this finding is simply the result of measurement inconsistencies. We measure inequality based on a consistent series of high-quality survey data for a single country, thus minimizing variation in measurement, units of analysis, and other methodological issues that are common in cross-national studies.

Although restricting the study to a single nation largely eliminates the problem of variability in the measurements, a time-series analysis at the national level provides a limited number of degrees of freedom. Because of the complex and multivariate sources of productivity, an adequate sample size is essential to estimate the net effect of inequality per se on productivity. To obtain a large sample, we use manufacturing industries by year as the unit of analysis. That is, our data set refers to measures of productivity, inequality, and other characteristics of different industries observed repeatedly over time. The analysis is restricted to manufacturing industries because productivity

data for that sector are publicly available and are more highly reliable than for other industries (Galle, Hinson, & Burr, 1985, p. 20).

Data

The National Bureau of Economic Research and U.S. Census Bureau's Center for Economic Studies' Manufacturing Industry Database (NBER-CES MID) provides information on productivity and other related factors for manufacturing industries. This database uses four-digit manufacturing industries classified according to Standard Industrial Classification (SIC) for the period between 1958 and 1996. The data are compiled from various official sources, most notably the Annual Survey of Manufactures and the Census of Manufactures.

This database does not, however, provide information on inequality. We therefore calculated the levels of wage inequality and the proportions of other demographic characteristics for each manufacturing industry. As a result of its large sample size, high quality, and annual availability, we used the Merged Outgoing Rotation Group of the Current Population Survey (CPS-MORG) that began in 1979. We matched the four-digit SIC industrial data on productivity (provided by the NBER-CES MID) with our inequality and demographic data (obtained from the CPS-MORG) that are organized in terms of three-digit census industrial codes. The matching was based on the three-digit SIC industrial codes that were used as the common denominator. As noted above, the industry-year is the unit of analysis in our statistical model. We obtained an unbalanced panel data set that includes 1,262 cases consisting of 72 manufacturing industries that operated between 1979 and 1996 in which the unit of observation is the three-digit SIC manufacturing industry-year. Each three-digit manufacturing industry has data for at least 3 years and most industries have 18 years of information.

The period between 1979 and 1996 is important to analyze because it covers the largest rise in income inequality that occurred in the United States during the 20th century (Nielsen & Alderson, 2001). In contrast, writing before 1979, an eminent economist once remarked that the distribution of income in the United States changed so little that studying it was like "watching the grass grow" (Aaron, 1978, p. 17). Thus, the time period for the data that we investigate affords an important opportunity to assess whether rising inequality is associated with increasing productivity.³

The period between 1979 and 1996 is also important to investigate because it is the era in which SBTC is said to be greatest and organizational

restructuring was first introduced on a wide scale to adapt to the new globalized level of market competition (Berg & Kalleberg, 2001; Cappelli, 2001; Card & DiNardo, 2002). In short, 1979 to 1996 is the period in which the New Economy is said to have crystallized while the immediate postwar phenomena of implicit contracts, wage rigidity, and traditional internal labor markets largely collapsed (Berg & Kalleberg, 2001; Cappelli, 2001; Hollister, 2004; Jacoby, 2001; Lindbeck & Snower, 2000). These changes have been rationalized as enhancing economic efficiency but there is actually very little research on productivity during this time period at the industrial level.

We recognize, however, that the results from our analysis cannot be readily generalized to other time periods. As discussed by Isaac and Griffin (1989), statistical models of time-series data are ultimately highly stylized simplifications of complex historical realities. It is therefore quite possible that the relationship between inequality and productivity could significantly change if other variables that are not directly controlled for in the model were altered (e.g., class consciousness among workers, surveillance technologies utilized by firms, demographic changes). We therefore recognize that our results are ultimately descriptive of the particular historical period that is represented by our data. Nonetheless, as discussed above, this period is important to investigate because the large increase in inequality that occurred during this time frame has been described by many as being necessitated by the need to increase productivity.

Statistical Model

We derive our statistical model from the Cobb–Douglas production function that is widely used in economics and has also been applied in sociological analyses (Liu & Sakamoto, 2005; Walters & Rubinson, 1983). Equation 1 shows the basic Cobb–Douglas production function.

$$\text{PROD}_{it} = \alpha K_{it}^{\beta_1} M_{it}^{\beta_2} L_{it}^{\beta_3}, \quad (1)$$

where α is a constant reflecting the scaling of the measures and PROD_{it} is the quantity produced at time t by industry i in terms of the total value of shipments based on net selling values. K_{it} refers to the total value of the real capital stock that is used in production at time t by industry i . M_{it} refers to material costs spent, and L_{it} refers to the number of workers employed at time t by industry i . All dollar figures are converted to 1996 constant dollars to adjust for inflation.

In general, industries with greater capital stock use more (or more expensive) plants and equipment that tend to have higher output due to the greater application of more productive and advanced technology. Material costs refer to the total delivered costs of raw materials, parts, and supplies put into production or used for repair and maintenance. Material costs also include purchased electric energy and fuels for heat and power as well as contract work done by others for the plant in the industry. The number of workers refers to production workers and all other workers including those in clerical, managerial, office, professional, sales, and technical occupations.

To estimate the net effect of wage inequality, we extend this production function to include the Gini index as well as various demographic variables as shown by Equation 2.

$$\text{PROD}_{it} = \alpha K_{it}^{\beta_1} M_{it}^{\beta_2} L_{it}^{\beta_3} \text{Gini}_{i(t-1)}^{\gamma} X_{ijt}^{\lambda_j}, \quad (2)$$

where $\text{Gini}_{i(t-1)}$ refers to the Gini index (multiplied by 100) for wage inequality in industry i at time $t - 1$ and X_{ijt} refers to a vector of J demographic characteristics of workers in industry i at time t . We treat inequality as a predetermined independent variable by lagging the Gini index by 1 year. The demographic control variables include the percentage of workers whose highest level of schooling is high school graduation or less, the percentage of workers who are African American, the percentage of workers who are Hispanic, the percentage of workers who are some other non-White racial/ethnic minority (e.g., Asian American or Native American), the percentage of workers who are female, the percentage of workers who are married, the percentage of workers who reside in a metropolitan area, and the mean age of workers. These demographic control variables are computed using the same data that were used to calculate the Gini index (i.e., the CPS-MORG).

The multiplicative form of Equation 2 is transformed into an additive function by taking the natural log of both sides of the equation so that the parameters may then be estimated using standard methods for regression models.

$$\ln(\text{PROD})_{it} = \beta_1 \ln(K_{it}) + \beta_2 \ln(M_{it}) + \beta_3 \ln(L_{it}) + \gamma \ln(\text{Gini}_{i(t-1)}) + \lambda_j \ln(X_{ijt}) + \alpha_i + \text{YEAR}_t + \varepsilon_{it} \quad (3)$$

In Equation 3, the parameter of primary research interest is γ , which refers to the coefficient for the lagged Gini index. Because both the lagged Gini index and the dependent variable are logged in Equation 3, γ refers to

an elasticity and may be interpreted as the expected percentage change in productivity (i.e., the dollar amount of the total value of shipments) in the industry resulting from increasing wage inequality (as measured by the Gini) in that industry by 1%.⁴ γ is net of the effects of the control variables including real capital stock, material costs, the number of employees, and the demographic variables mentioned above. In terms of our earlier theoretical discussion, a positive γ would indicate that increasing wage inequality raises productivity as predicted by the SBTC explanation.

To account for industry-specific heterogeneity, we add industry-specific intercepts (i.e., α_i) to Equation 3. Thus, we convert Equation 3 into a fixed-effects panel model by including dummy variables to indicate each of the various industries. Between-industry variation in productivity may to some extent derive from differences in technology or other industry-specific characteristics that may be evident even net of real capital stock and the other control variables. In using this specification, our focus is on how *changes* in wage inequality have affected productivity. That is, the fixed-effects panel model estimates the net effects of changes in independent variables rather than focusing on cross-sectional differences in productivity between the industries.

We also control for annual fluctuations by adding a vector of dummy variables to indicate each of the years (i.e., $YEAR_t$). This approach allows for unmeasured temporal effects and thereby provides a more unbiased estimate of the net effect of increasing wage inequality per se on productivity. Although random-effects models have recently been popular in sociology, Halaby (2004) discusses the problem of the correlation between any of the covariates and the random effect resulting in biased estimates. Following the recommendation of Halaby, we computed a Hausman test statistic for this correlation in a random-effects model using our data as described above. The results show that the test statistic is highly significant indicating that the random effects model yields biased estimates using our data.⁵ For this reason, the fixed-effects model is better suited for our analysis.

In our analysis, we estimate several shorter versions of Equation 3 to assess the robustness of the results. For example, we omit the demographic control variables in several of the short models because there are no clear theoretical justifications for including race/ethnicity, gender, marital status, or metropolitan residence in a production function. Because these demographic variables are well-known to be associated with wages, however, we include them in the full model simply to provide a more thorough analysis of the net effect of wage inequality per se on productivity. For example, if labor market discrimination forces women and minorities to be overrepresented in industries

with declining productivity then our full model provides a more precise estimate of γ .

Finally, we estimate an extension of Equation 3 that includes the log of the percentage of employees who are unionized in the industry during the given year. We include the percentage unionized as an additional control variable because it may be associated with both wage inequality and productivity. The percentage unionized is calculated using the CPS-MORG to ensure that this variable is consistently based on the same industrial classification that is used in our analysis. Because information on union status is available in the CPS-MORG only since 1983, the model that includes percentage unionized as an additional control variable is estimated using the data from 1983 to 1996.

Empirical Results

Descriptive Statistics

Table 1 shows the descriptive statistics for our data. The mean for the total value of shipments across manufacturing industries decreased from \$13,807 million in 1979 to \$11,347 million in 1996 (in constant 1996 dollars). This reduction by itself does not necessarily imply, however, a decline in productivity. The reduction instead reflects a general decline in the total size of the U.S. manufacturing sector during this period. This decline in the U.S. manufacturing sector is also evident in Table 1 in terms of the reduction in the mean employment of workers across manufacturing industries from 54,257 in 1979 to 43,441 in 1996. Similarly, Table 1 shows that the mean for the total cost of materials declined across manufacturing industries over this time period.

On the other hand, Table 1 indicates that the mean value of shipments per worker increased from \$233,704 in 1979 to \$264,440 in 1996. This change represents an average increase of over \$30,000 per individual worker. This increase is suggestive of a significant growth in productivity from 1979 to 1996 in the manufacturing sector. Part of this improvement is probably due to the increase in mean real capital stock per worker over this time period as is also evident in Table 1.

Along with this growth in productivity, the level of wage inequality within manufacturing industries also increased rapidly. Table 1 shows that the mean Gini index increased by 18% from 23.08 in 1979 to 27.28 in 1996. The coincidence between rising productivity and increasing wage inequality ostensibly suggests that the two variables have some sort of positive relationship.

Table 1
Descriptive Statistics by Three-Digit Manufacturing Industry, 1979–1996

Variable	Total (1979 Through 1996)						
	<i>M</i>	<i>SD</i>	Min	Max	1979 Mean	1996 Mean	Change
Total value shipments, (\$, in millions)	1,181.350	26,728.910	427.881	348,229.800	13,806.660	11,347.200	-2,459.460
Total real capital (\$, in millions)	5,367.193	9,876.273	133.826	89,295.140	4,802.707	5,943.955	1,141.248
Total cost of materials (\$, in millions)	386.911	757.592	5.353	9,277.523	443.728	384.058	-59.670
Value shipments (\$, in thousands) per worker	241.453	313.508	62.046	3,704.021	233.704	264.440	3.736
Real capital (\$, in thousands) per worker	114.418	131.839	9.911	1,328.797	86.299	136.408	5.109
Cost of materials (\$, in thousands) per worker	139.879	271.402	18.291	3,354.251	144.951	144.584	-.368
Employment (\$, in thousands)	46.890	54.597	4.620	443.400	54.257	43.441	-1.816
Gini index of wage inequality	25.537	3.683	9.732	45.517	23.079	27.278	4.199
% Less than high school	22.514	11.342	0.000	61.702	31.262	15.057	-16.206
% High school graduate	42.884	6.681	0.000	10.000	4.347	42.130	1.783
% Some college	2.159	6.038	0.000	41.304	17.807	24.529	6.721
% BA	1.954	6.380	0.000	5.000	7.876	13.563	5.687
% Advanced degree	3.303	3.275	0.000	2.000	2.372	4.722	2.350
Mean age (in years)	39.047	1.943	3.000	52.250	37.905	39.765	1.860
% Female	33.064	16.530	0.000	86.364	32.771	32.315	-.457
% White	8.370	8.084	2.000	10.000	82.094	78.338	-3.757
% African American	9.851	5.243	0.000	4.000	1.050	9.172	-.878
% Hispanic	6.951	4.784	0.000	6.000	5.759	9.142	3.384
% Other racial/ethnic minority	2.829	2.359	0.000	21.875	2.097	3.348	1.251
% Married	69.002	6.588	34.694	10.000	72.275	65.368	-6.907
% Metropolitan resident	67.912	16.160	9.388	10.000	65.526	72.521	6.995
% Union	23.272	13.756	0.000	66.556	3.370 ^a	17.958	-12.412

a. Refers to % Union in 1983.

Figure 1
Change Between 1979 and 1996 in Total Shipments per Employee and Gini Index Across Manufacturing Industries



As noted above, however, our substantive interest is not with explaining cross-sectional variation between industries but rather with assessing how increasing inequality has affected productivity in recent years.⁶ This latter concern is considered in Figure 1, which plots the *change* (i.e., difference) between 1979 and 1996 in productivity and inequality for each of the manufacturing industries. Figure 1 generally shows the lack of any significant positive association across industries in terms of the change in productivity and the change in inequality between 1979 and 1996.

Other results for Table 1 indicate that the percentage of workers with less than a high school education was reduced dramatically from 31.26% in 1979 to 15.06% in 1996 whereas the percentages of workers with some college or a college degree increased significantly. The percentage of workers who were White declined slightly whereas the percentage of workers who

were Hispanic increased slightly over this period. There was little change in the percentages that were African American or female while mean age increased slightly.

Multivariate Results

Table 2 shows the results of fixed-effects panel regression models. Although not shown, all the models in Table 2 include industry-specific fixed effects and year-specific fixed effects. The reported coefficients for the other independent variables are net of these effects.

Model 1 of Table 2 shows the results for the most basic Cobb–Douglas production function derived from Equation 1. As expected, increases in real capital stock, material costs, and employment contribute positively to the growth of productivity. The R^2 indicates that 90% of the variance in the dependent variable is explained in Model 1. ρ indicates that 92% of the R^2 value is itself explained by the fixed effects. σ_u refers to the standard deviation of the fixed effects whereas σ_e refers to the standard deviation of the residuals (i.e., the standard error of estimate).

For comparative purposes, Model 2 includes the Gini as the only covariate. Before controlling for any other independent variable, a 1% increase in inequality reduces the growth in productivity by about 0.15% and this negative effect is statistically significant at any conventional level. The overall correlation between the growth in inequality and the growth in productivity is therefore significantly negative after allowing for the fixed effects for industry and year.

However, to obtain an estimate of the direct causal effect of the growth in inequality on the growth in productivity, the other control variables need to be included. This is done in the other models shown in Table 2. After controlling for real capital stock, material costs, and employment, the coefficient for the Gini is greatly reduced to $-.02$ and is no longer statistically significant in Model 3. The fuller specification is Model 5, which includes the Gini, real capital stock, material costs, employment, and the set of demographic variables. In Model 5, the coefficient for the Gini is again $-.02$ and is not statistically significant as in Model 3. Indeed, the estimated sign of the coefficient is negative, which is opposite of the expectation of the SBTC view. In sum, none of these regression results in Table 2 provide any support for the hypothesis that increasing inequality has a positive effect on productivity.

Other results from Model 5 in Table 2 show that the net effects of the percentages of African Americans and females do not significantly affect

Table 2
Fixed-Effects Regression Models of Total Value of Shipments
Across Manufacturing Industries, 1979 to 1996

	Coefficient (Standard Error)					
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6 ^a
Real capital	.07986 (.01284)***		.07675 (.01375)***	.06387 (.01397)***	.05256 (.01442)***	.01142 (.01528)
Material costs	.72702 (.01382)***		.72625 (.01429)***	.71825 (.01422)***	.71525 (.01436)***	.69765 (.01494)***
Employment	.22339 (.01544)***		.22257 (.01610)***	.25017 (.01654)***	.24796 (.01681)***	.24697 (.01688)***
Gini index		-.15374 (.04833)**	-.02488 (.01601)		-.02236 (.01660)	-.01739 (.01537)
% High school or less				-.09555 (.02203)***	-.10774 (.02311)***	-.09110 (.02167)***
% African American				-.00028 (.00062)	.00027 (.00064)	.00025 (.00067)
% Hispanic				.00176 (.00051)***	.00225 (.00051)***	.00130 (.00046)**
% Other minority				.00009 (.00025)	.00028 (.00025)	-.00032 (.00023)
% Female				.00147 (.00182)	.00067 (.00186)	.00072 (.00166)

(continued)

Table 2 (continued)

	Coefficient (Standard Error)					
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6 ^a
Mean age				.01443 (.05080)	.01778 (.05452)	-.00352 (.05058)
% Married				-.00031 (.02332)	-.01643 (.02413)	-.00101 (.02224)
% Metropolitan				.04857 (.01596)**	.03938 (.01652)*	.04122 (.01633)*
% Union						.00170 (.00586)
Constant	1.43923 (.09750)***	8.54900 (.07322)***	1.44087 (.11138)***	1.44087 (.11138)***	1.53839 (.22641)***	2.16527 (.23407)***
R ²	.90286	.00900	.89323	.89323	.89766	.88473
σ _u	.16519	1.00814	.16986	.16986	.15631	.19041
σ _e	.04752	.14121	.04635	.04635	.04542	.03789
ρ	.92356	.98076	.93070	.93070	.92213	.96191
-2LL	-4373.804	-1374.360	-4028.946	-4227.364	-4075.690	-3748.526
BIC	-4223.007	-1246.889	-388.230	-402.291	-387.397	-3562.480

a. Model 6 is estimated using the subsample of data from 1983 to 1996.

* $p < .05$. ** $p < .01$. *** $p < .001$ (two-tailed tests).

productivity (relative to the reference group which is non-Hispanic White men). However, these groups are paid lower wages relative to their years of schooling and age (Farley, 1996; Levy, 1998) even within U.S. manufacturing industries (Hellerstein, Neumark, & Troske, 1999). Lower wages despite equivalent productivity suggest that African American and female workers are underpaid in manufacturing industries. Other productivity research for the U.S. manufacturing sector has reached similar conclusions (Galle et al., 1985; Hellerstein et al., 1999).

On the other hand, hiring more workers with only a high school degree or less has a substantially negative effect on productivity. A 1% increase in this proportion reduces the growth in productivity by about 0.11%.⁷ This finding indicates that schooling does have a positive net effect on productivity contrary to strong versions of the credentialist view of education (Collins, 1979). Whether this positive effect derives from human capital or from market signaling (or from some combination of the two) cannot, however, be ascertained from this analysis.

Unionization in the United States has continually and substantially declined in recent decades, but the wages of union members are still significantly higher than for nonunion members across the major demographic groups (Cornfield & Fletcher, 2001). Furthermore, earlier research found that unions often tend to increase productivity (Freeman & Medoff, 1984) although a couple of latter studies have raised issues with that conclusion (B. T. Hirsch, 1992; Odgers & Betts, 1997). In any event, the potential association of unionization with both wage inequality and productivity implies that unionization may be an omitted variable that needs to be controlled for to more accurately estimate the net effect of wage inequality on productivity. To investigate this possibility, Table 2 shows the results for an extended version of our regression (i.e., Model 6) that includes the percentage union as an additional control variable (using the data from 1983 to 1996).

The results for Model 6 show that the net effect of the percentage union on productivity is very close to zero and is not statistically significant for the period between 1983 and 1996. Furthermore, controlling for the percentage union in Model 6 does not substantially change the estimated net effects of any of the other independent variables relative to their coefficients in Model 5. These results thus indicate that after controlling for capital stock, material costs, employment, inequality, and the demographic control variables in a fixed-effects model, unions do not have a net effect on productivity during this time period for manufacturing industries. In particular, the net effect of wage inequality on productivity is still close

to zero and not statistically significant in Model 6 after controlling for the percentage union.⁸

To further investigate the robustness of this general conclusion, we estimated several different specifications of our model. First, we estimated the regression using other measures of wage inequality including Atkinson indexes, entropy indexes, and the ratios of different percentiles. In all these models, the estimated coefficient for wage inequality is close to zero and negative. In most cases (although not all), the negative coefficient is also not statistically significant.⁹ These results are consistent with our general finding in Table 2 that increases in wage inequality do not have a net positive effect on productivity.

As an additional check, we estimated these models using 2-year and 5-year lagged variables for the Gini inequality index. In these additional analyses, inequality is very clearly a predetermined variable and thus its estimated coefficient may be more confidently interpreted as a causal effect. The basic results for these regressions are consistent with Table 2 when using either of these lagged variables. That is, the results support our major conclusion that raising inequality does not increase productivity. Finally, we note that this result is similarly robust with respect to another available measure of productivity that we explored in other results for these data (i.e., value added, which refers to the value of shipments minus material costs plus changes in inventories).

Discussion and Conclusion

As noted by Jencks (2002, p. 65), “given the centrality of redistribution in modern politics, it is remarkable how little effort rich societies have made to assemble the kinds of evidence they would need to assess the costs and benefits of limiting inequality.” To help fill this research gap, we have provided a detailed analysis of the net effect of increasing wage inequality on productivity in U.S. manufacturing industries from 1979 to 1996. Using fixed-effects panel models that control for unobserved differences in productivity across these industries, the findings do not support the SBTC argument. According to this view, increasing wage inequality in recent decades has enhanced productivity. The results from our regression analyses indicate, however, that increasing wage inequality has not had a positive net effect on productivity. To the contrary, the estimated coefficient has a negative sign. This same general conclusion is also evident throughout the

regression analyses investigated in this research and is not sensitive to minor changes in the model specification or measures.

Although it has not been our objective in this article to propose and test a codified alternative theory to the SBTC view, the conclusion that rising wage inequality has not enhanced productivity underscores the significance of P. M. Hirsch and Soucey's (2006) discussion regarding the role of power and authority in influencing the economic outcomes associated with organizational restructuring in recent decades. Rather than reflecting some heightened organizational imperative for greater efficiency, the increased inequality brought about in the New Economy is probably at least partly a reflection of power differentials in the labor force. The decline in unions, the falling real value of the minimum wage, the increased number of part-time workers, and the dismantling of internal labor market practices have all increased inequality but may be less important to improving productivity than is usually assumed in popular business rhetoric associated with discussions of organizational restructuring. Rather, these changes may stem from class conflict in which the employment outcomes for the workers with the least bargaining power are simply downgraded by way of the aforementioned institutional changes.

As noted above, our results do not find any negative effect of unionization on productivity despite popular attitudes about this connection that has been traditionally common among business leaders (Freeman & Medoff, 1984). Furthermore, Jencks (2002) and DiPrete (2005) argue that European economies tend to be quite productive despite having significantly lower levels of wage inequality as well as institutional features of their labor markets (e.g., higher rates of unionization) that are more generous to workers (see also Carbonaro, 2006; DiPrete & McManus, 1996). These analyses are consistent with the basic conclusion of our research here that increases in wage inequality have not improved productivity in U.S. manufacturing industries in recent decades.

We emphasize that our conclusion is limited to the U.S. manufacturing sector during the period between 1979 and 1996. Whether rising wage inequality has increased productivity in other time periods or in other industrial sectors remains a moot issue that should be considered in future research. We hope that our preliminary efforts here will help to encourage future research on productivity, which sociologists have unfortunately neglected in recent decades. This topic is important in terms of both public policy as well as theory and should not continue to be ignored by sociologists.

Appendix Matrix of Correlation Coefficients

	Gini	Vship PP	Vship	Vadd PP	Vadd	Capital PP	Capital	Emp	LTHS	HSG	SC	Col	Grad	Age	Female	White	Black	Other	Married	Union
Gini	1.000																			
Vship PP	-0.13	1.000																		
Vship	-0.48	.891	1.000																	
Vadd PP	.150	.634	.368	1.000																
Vadd	.088	.495	.703	.383	1.000															
Capital PP	-0.37	.847	.697	.605	.437	1.000														
Capital	-0.59	.810	.888	.387	.734	.851	1.000													
Emp	.070	.030	.339	-0.036	.802	.005	.386	1.000												
LTHS	-0.301	-0.258	-0.222	-0.415	-0.420	-0.326	-0.290	-0.209	1.000											
HSG	-0.268	-0.128	-0.106	-0.259	-0.230	-0.078	-0.087	-0.121	.038	1.000										
SC		.256	.238	.213	.391	.403	.283	.269	.242	-0.807	-0.289	1.000								
Col	.397	.256	.220	.435	.439	.271	.256	.227	-0.723	-0.575	.543	1.000								
Grad		.346	.228	.174	.422	.346	.255	.205	.092	-0.627	-0.553	.468	.746	1.000						
Age	-0.131	.188	.127	.274	.131	.326	.233	-0.046	-0.259	-0.016	.185	.212	.185	1.000						
Female	.301	-0.180	-0.145	-0.113	-0.098	-0.307	-0.222	-0.020	.236	-0.177	-0.270	-0.001	.043	-0.196	1.000					
White	-0.172	.055	.084	.009	.164	.133	.142	.128	-0.353	.153	.250	.179	.096	.114	-0.464	1.000				
Black	-0.093	-0.037	-0.027	.170	-0.070	-0.009	-0.057	-0.053	.391	-0.054	-0.307	-0.249	-0.176	.048	.138	-0.644	1.000			
Other	.336	-0.041	-0.001	-0.057	.026	-0.079	-0.021	.025	-0.097	-0.288	.142	.209	.258	-0.102	.344	-0.516	-0.019	1.000		
Married	-0.422	.222	.172	.152	.071	.319	.233	-0.064	.003	.067	-0.043	-0.033	.002	.403	.002	.433	-0.064	-0.345	1.000	
Metro	.241	.080	.077	.264	.269	.089	.108	.105	-0.573	-0.273	.510	.556	.510	.234	.073	-0.007	-0.204	.228	-0.125	1.000
Union	-0.470	.149	.172	.044	.096	.263	.259	.039	.048	-0.253	-0.028	-0.202	-0.230	.365	-0.404	.147	-0.281	.014	.391	.014

Notes

1. These inefficiencies relate to the “deadweight” welfare loss to society described by A. B. Sørensen (1996) and by Pindyck and Rubinfeld (1992).

2. In a study using data for a sample of workers in one metropolitan area, Walsh and Tseng (1998) found that wages were not clearly related with workers’ statements about whether they exert extra effort in their jobs. Instead, higher wages were more often associated with workers’ participation in management and with greater recognition from supervisors. These results suggest that increasing inequality may not automatically raise productivity as much as is assumed in the efficiency wage literature (Liu & Sakamoto, 2005).

3. In more technical terms, the independent variable of key research interest has sufficient variance to accurately estimate its net effect in a regression model.

4. γ is technically a point elasticity but it is a constant in this model because the Cobb–Douglas specification implies linearity after the variables are logged. See Chiang (1984) for further discussion of elasticities.

5. These results are available from the authors on request.

6. As a descriptive result, however, we note that no positive association between productivity and inequality is evident in the scatterplot obtained by pooling all 18 years of cross-sectional data across all the industries.

7. This change refers to a percentage change in the proportion, not to an absolute change in the proportion.

8. To investigate the role of unions more fully, we estimated an additional specification in which the percentage union was lagged by 2 years as well as another specification in which the Gini index of wage inequality was omitted but the percentage union lagged by 2 years was included. In both of these specifications, however, the coefficient for the percentage union was small and not statistically significant at any conventional level.

9. These results are also available from the authors on request.

References

- Aaron, H. J. (1978). *Politics and the professors*. Washington, DC: Brookings Institution.
- Acemoglu, D. (2002). Technical change, inequality, and the labor market. *Journal of Economic Literature*, 40, 7-72.
- Akerlof, G. A., & Yellen, J. L. (1990). The fair wage-effort hypothesis and unemployment. *Quarterly Journal of Economics*, 105, 255-283.
- Alesina, A., & Perotti, R. (1994). The political economy of growth: A critical survey of the recent literature. *World Bank Economic Review*, 8, 351-372.
- Alter, J. (2005, September 19). The other America. *Newsweek*, pp. 42-48.
- American Political Science Association. (2004). Leading political scientists warn of threat to American democracy in rare nonpartisan statement [Press release]. Washington, DC: American Political Science Association. Retrieved August 18, 2006, from <http://www.apsanet.org/imgtest/taskforcepress.pdf>
- Aoki, M. (1988). *Information, incentives, and bargaining in the Japanese economy*. Cambridge, UK: Cambridge University Press.
- Atkinson, A. (1999). Is rising income inequality inevitable? A critique of the transatlantic consensus. In *WIDER annual lecture*. University of Oslo, Norway.

- Autor, D., & Katz, L. F. (1999). Changes in the wage structure and earnings inequality. In O. Ashenfelter & D. Card (Eds.), *Handbook of labor economics* (Vol. 3A, pp. 3309-3415). Amsterdam: Elsevier.
- Autor, D., Katz, L. F., & Kearney, M. S. (2006). The polarization of the U.S. labor market. *American Economic Review*, 96, 189-194.
- Bartels, L. M. (2006). Is the water rising? Reflections on inequality and American democracy. *PS: Political Science and Politics*, January, pp. 39-42.
- Berg, I., & Kalleberg, A. (2001). Emerging labor market structures: Contexts and correlates. In I. Berg & A. Kalleberg (Eds.), *Sourcebook of labor markets: Evolving structures and processes* (pp. 3-29). New York: Kluwer Academic/Plenum.
- Bernhardt, A., Morris, M., Handcock, M. S., & Scott, M. A. (2001). *Economic mobility in the new American labor market*. New York: Russell Sage Foundation.
- Bernstein, J., & Mishel, L. (2001). Seven reasons for skepticism about the technology story of U.S. wage inequality. In I. Berg & A. Kalleberg (Eds.), *Sourcebook of labor markets: Evolving structures and processes* (pp. 409-428). New York: Kluwer Academic/Plenum.
- Blank, R. M. (1998). Contingent work in a changing labor market. In R. B. Freeman & P. Gottschalk (Eds.), *Generating jobs* (pp. 258-294). New York: Russell Sage Foundation.
- Bound, J., & Johnson, G. (1992). Changes in the structure of wages in the 1980s: An evaluation of alternative explanations. *American Economic Review*, 82, 371-392.
- Budros, A. (1997). The new capitalism and organizational rationality: The adoption of downsizing programs 1979-1994. *Social Forces*, 76, 229-250.
- Burtless, G., & Jencks, C. (2003). American inequality and its consequences. In H. Aaron, J. Lindsay, & P. Nivola (Eds.), *Agenda for the nation* (pp. 61-108). Washington, DC: Brookings Institution.
- Cappelli, P. (2001). Assessing the decline of internal labor markets. In I. Berg & A. Kalleberg (Eds.), *Sourcebook on labor markets: Evolving structures and processes* (pp. 207-245). New York: Kluwer Academic/Plenum.
- Cappelli, P. (2006). Tracing the path of research in organizations and work. *Work and Occupations*, 20, 1-3.
- Carbonaro, W. (2006). Cross-national differences in the skills-earnings relationship: The role of labor market institutions. *Social Forces*, 84, 1819-1842.
- Card, D., & DiNardo, J. E. (2002). Skill-biased technological change and rising wage inequality: Some problems and puzzles. *Journal of Labor Economics*, 20, 733-783.
- Chiang, A. C. (1984). *Fundamental methods of mathematical economics*. New York: McGraw-Hill.
- Clarke, G. R. G. (1995). More evidence on income distribution and growth. *Journal of Development Economics*, 47, 403-428.
- Clawson, D., & Clawson, M. A. (1999). What has happened to the US labor movement? Union decline and renewal. *Annual Review of Sociology*, 25, 95-119.
- Collins, R. (1979). *The credentialist society: A historical sociology of education and stratification*. New York: Academic Press.
- Cornfield, D. B., & Fletcher, B. (2001). The U.S. labor movement: Toward a sociology of labor revitalization. In I. Berg & A. Kalleberg (Eds.), *Sourcebook of labor markets: Evolving structures and processes* (pp. 61-82). New York: Kluwer Academic/Plenum.
- Davis, G., Diekmann, K., & Tinsley, C. (1994). The decline and fall of the conglomerate firm in the 1980s: The deindustrialization of an institutional form. *American Sociological Review*, 59, 547-570.

- Davis, K., & Moore, W. (1945). Some principles of stratification. *American Sociological Review*, *10*, 242-249.
- DiPrete, T. A. (2005). Labor markets, inequality, and change: A European perspective. *Work and Occupations*, *32*, 119-139.
- DiPrete, T. A., & McManus, P. A. (1996). Institutions, technical change, and diverging life chances: Earnings mobility in the United States and Germany. *American Journal of Sociology*, *102*, 34-79.
- Dunne, T., Foster, L., Haltiwanger, J., & Troske, K. R. (2004). Wage and productivity dispersion in United States manufacturing: The role of computer investment. *Journal of Labor Economics*, *22*, 397-429.
- Farley, R. (1996). *The new American reality*. New York: Russell Sage Foundation.
- Forbes, K. J. (2000). A reassessment of the relationship between inequality and growth. *American Economic Review*, *90*, 869-887.
- Frank, R. H., & Cook, P. J. (1995). *The winner-take-all society: Why the few at the top get so much more than the rest of us*. New York: Penguin.
- Freeman, R. B., & Medoff, J. L. (1984). *What do unions do?* New York: Basic Books.
- Frenkel, S. J. (2003). The embedded character of workplace relations. *Work and Occupations*, *30*, 135-153.
- Galle, O. R., Hinson, C., & Burr, J. A. (1985). Racial mix and industrial productivity. *American Sociological Review*, *50*, 20-33.
- Gordon, D. M. (1996). *Fat and mean: The myth of managerial "downsizing" and the corporate squeeze of working Americans*. New York: Martin Kessler.
- Gottschalk, P. (1997). Inequality, income growth, and mobility: The basic facts. *Journal of Economic Perspectives*, *11*, 21-40.
- Gowing, M. K., Kraft, J. D., & Quick, J. C. (Eds.). (1997). *The new organizational reality: Downsizing, restructuring, and revitalization*. Washington, DC: American Psychological Association.
- Granovetter, M. (1981). Toward a sociological theory of income differences. In I. Berg (Ed.), *Sociological perspectives on labor markets* (pp. 11-47). New York: Academic Press.
- Granovetter, M. (1985). Economic action and social structure: The problem of embeddedness. *American Journal of Sociology*, *91*, 481-510.
- Granovetter, M., & Tilly, C. (1988). Inequality and labor processes. In N. J. Smelser (Ed.), *The handbook of sociology* (pp. 175-221). Newbury Park, CA: Sage.
- Halaby, C. N. (2004). Panel models in sociological research: Theory into practice. *Annual Review of Sociology*, *30*, 507-544.
- Harrison, B., & Bluestone, B. (1988). *The great U-turn: Corporate restructuring and the polarizing of America*. New York: Basic Books.
- Hellerstein, J. K., Neumark, D., & Troske, K. R. (1999). Wages, productivity, and worker characteristics: Evidence from plant-level production functions and wage equations. *Journal of Labor Economics*, *17*, 409-446.
- Herrnstein, R. J., & Murray, C. (1994). *The bell curve: Intelligence and class structure in American life*. New York: Free Press.
- Hirsch, B. T. (1992). Firm investment behavior and collective bargaining strategy. *Industrial Relations*, *31*, 95-121.
- Hirsch, P. M., & Soucey, M. D. (2006). Organizational restructuring and its consequences: Rhetorical and structural. *Annual Review of Sociology*, *32*, 171-189.
- Hollister, M. N. (2004). Does firm size matter anymore? The new economy and firm size wage effects. *American Sociological Review*, *69*, 659-676.

- Isaac, L., & Griffin, L. (1989). A historicism in time-series analysis of historical process. *American Sociological Review*, *54*, 873-890.
- Jacoby, S. M. (2001). Risk and the labor market: Societal past as economic prologue. In I. Berg & A. Kalleberg (Eds.), *Sourcebook of labor markets evolving structures and processes* (pp. 31-60). New York: Kluwer Academic/Plenum.
- Jencks, C. (2002). Does inequality matter? *Daedalus*, *131*, 49-65.
- Juhn, C., Murphy, K. M., & Pierce, B. (1993). Wage inequality and the rise in returns to skill. *Journal of Political Economy*, *101*, 410-442.
- Kalleberg, A. (2001). Evolving employment relations in the United States. In I. Berg & A. Kalleberg (Eds.), *Sourcebook of labor markets: Evolving structures and processes* (pp. 187-206). New York: Kluwer Academic/Plenum.
- Kalleberg, A. (2003). Flexible firms and labor market segmentation. *Work and Occupations*, *30*, 154-175.
- Kalleberg, A. L., & Berg, I. (1987). *Work and industry: Structures, markets, and processes*. New York: Plenum.
- Kalleberg, A. L., & Mow, T. (2006, August). *Occupations and the structure of wage inequality in the United States*. Paper presented at the 2006 meetings of the American Sociological Association, Montreal, Canada.
- Kim, C., & Sakamoto, A. (in press). The rise of intra-occupational wage inequality in the U.S., 1983-2002. *American Sociological Review*.
- Koike, K. (1983). Internal labor markets: Workers in large firms. In T. Shirai (Ed.), *Contemporary industrial relations in Japan* (pp. 29-61). Madison: University of Wisconsin Press.
- Krueger, A. B., & Lindahl, M. (2001). Education for growth: Why and for whom? *Journal of Economic Literature*, *39*, 1101-1136.
- Krugman, P. (2002, October 20). For richer: How the permissive capitalism of the boom destroyed American equality. *New York Times Magazine*, pp. 62-67.
- Lenski, G. (2001). New light on old issues: The relevance of "really existing socialist societies" for stratification theory. In D. B. Grusky (Ed.), *Social stratification: Class, race and gender in sociological perspective* (pp. 77-84). Boulder, CO: Westview Press.
- Levy, F. (1998). *The new dollars and dreams: American incomes and economic change*. New York: Russell Sage Foundation.
- Levy, F., & Murnane, R. J. (1992). U.S. earnings levels and earnings inequality: A review of recent trend and proposed explanations. *Journal of Economic Literature*, *30*, 1333-1381.
- Lincoln, J. R., & Kalleberg, A. L. (1990). *Culture, control, and commitment: A study of work organization and work attitudes in the United States and Japan*. Cambridge, UK: Cambridge University Press.
- Lindbeck, A., & Snower, D. J. (2000). Multitask learning and the reorganization of work: From tayloristic to holistic organization. *Journal of Labor Economics*, *18*, 353-376.
- Lindert, P. H. (2004). *Growing public*. Cambridge, UK: Cambridge University Press.
- Liu, J., & Sakamoto, A. (2005). Relative deprivation, efficiency wages, and labor productivity in Taiwanese manufacturing industries. *Research in social stratification and mobility*, *23*, 305-341.
- Lloyd-Ellis, H. (2003). On the impact of inequality on productivity growth in the short and long term: A synthesis. *Canadian Public Policy*, *29*, 65-86.
- Meyer, M. W. (2001). What happened to middle management? In I. Berg & A. Kalleberg (Eds.), *Sourcebook of labor markets: Evolving structures and processes* (pp. 449-466). New York: Kluwer Academic/Plenum.

- Mishel, L., & Bernstein, J. (1995). *The state of working America, 1994-1995*. New York: M. E. Shapre.
- Morris, M., & Western, B. (1999). Inequality in earnings at the close of the twentieth century. *Annual Review of Sociology, 25*, 623-657.
- Murphy, K. M., & Welch, F. (1993). Industrial change and the rising importance of skill. In S. Danziger & P. Gottschalk (Eds.), *Uneven tides: Rising inequality in America* (pp. 19-98). New York: Russell Sage Foundation.
- Neckerman, K. M. (2004). *Social inequality*. New York: Russell Sage Foundation.
- Nielsen, F., & Alderson, A. (2001). Trends in income inequality in the United States. In I. Berg & A. Kalleberg (Eds.), *Sourcebook of labor markets: Evolving structures and processes* (pp. 355-386). New York: Kluwer Academic/Plenum.
- Norsworthy, J. R., & Zabala, C. A. (1985). Worker attitudes, worker behavior, and productivity in the U.S. automobile industry, 1959-76. *Industrial and Labor Relations Review, 38*, 544-557.
- Odgers, C., & Betts, J. R. (1997). Do unions reduce investment? Evidence from Canada. *Industrial and Labor Relations Review, 51*, 18-36.
- Okun, A. (1975). *Equality and efficiency: The big tradeoff*. Washington, DC: Brookings Institution.
- Perotti, R. (1996). Growth, income distribution and democracy: What the data say. *Journal of Economic Studies, 60*, 755-776.
- Persson, T., & Tabellini, G. (1992). Growth, distribution and politics. *European Economic Review, 36*, 593-602.
- Piketty, T., & Saez, E. (2003). Income inequality in the United States, 1913-1998. *Quarterly Journal of Economics, 118*, 1-39.
- Pindyck, R. S., & Rubinfeld, D. L. (2001). *Microeconomics* (5th ed.). Upper Saddle River, NJ: Prentice Hall.
- Republican National Committee. (2004). *2004 Republican party platform: A safer world and a more hopeful America*. Retrieved August 20, 2006, from <http://www.gop.com/media/2004platform.pdf>
- Sakamoto, A., & Chen, M. D. (1993). Earnings inequality and segmentation by firm size in Japan and the United States. *Research in Social Stratification and Mobility, 12*, 185-211.
- Schmitt, J. (2001). Did job quality deteriorate in the 1980s and 1990s? In I. Berg & A. Kalleberg (Eds.), *Sourcebook of labor markets: Evolving structures and processes* (pp. 387-407). New York: Kluwer Academic/Plenum.
- Shibata, H. (2001). Productivity and skill at a Japanese transplant and its parent company. *Work and Occupations, 28*, 234-260.
- Shimada, H. (1985). The perceptions and the reality of Japanese industrial relations. In L. C. Thurow (Ed.), *The management challenge: Japanese views* (pp. 42-66). Cambridge, MA: MIT Press.
- Simpson, R. (1956). A modification of the functional theory of social stratification. *Social Forces, 35*, 132-137.
- Slevin, P. (2005, June 15). Edwards builds new platform: U.S. poverty called great moral issue. *Washington Post*, p. A03.
- Smelser, N. J., & Swedberg, R. (1994). The sociological perspective on the economy. In N. Smelser & R. Swedberg (Eds.), *The handbook of economic sociology* (pp. 3-26). New York: Russell Sage Foundation.
- Sørensen, A. B. (1996). The structural basis of social inequality. *American Journal of Sociology, 101*, 1333-1365.

- Sørensen, A. B., & Kalleberg, A. L. (1981). An outline of a theory of the matching of persons to jobs. In I. Berg (Ed.), *Sociological perspectives on labor markets* (pp. 49-74). New York: Academic Press.
- Sørensen, J. B. (2007). Organizational diversity, labor markets and wage inequality. *American Behavioral Scientist*, 50, 659-676.
- Takeuchi, H. (1985). Motivation and productivity. In L. C. Thurow (Ed.), *The management challenge: Japanese views* (pp. 18-30). Cambridge: MIT Press.
- Tokunaga, S. (1984). The structure of the Japanese labour market. In S. Tokunaga & J. Bergmann (Eds.), *Industrial relations in transition* (pp. 25-55). Tokyo: University of Tokyo Press.
- Tumin, M. M. (1953). Some principles of stratification: A critical analysis. *American Sociological Review*, 18, 387-394.
- Wallace, M., & Brady, D. (2001). The next long swing: Spatialization, technocratic control, and the restructuring of work at the turn of the century. In I. Berg & A. Kalleberg (Eds.), *Sourcebook of labor markets: Evolving structures and processes* (pp. 101-133). New York: Kluwer Academic/Plenum.
- Walsh, J. P., & Tseng, S. (1998). The effects of job characteristics on active effort at work. *Work and Occupations*, 25, 74-96.
- Walters, P. B., & Rubinson, R. (1983). Educational expansion and economic growth in the United States, 1870-1969: A production function analysis. *American Sociological Review*, 48, 480-493.
- Weeden, K. A., Kim, Y. M., Carlo, M. D., & Grusky, D. B. (2007). Social class and earnings inequality. *American Behavioral Scientist*, 50, 702-736.
- Welch, F. (1999). In defense of inequality. *American Economic Review*, 89, 1-17.
- Zuckerman, E. W. (2000). Focusing the corporate product: Securities analysts and dediversification. *Administrative Science Quarterly*, 45, 591-619.

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