American Sociological Review
78(3) 361–389

DOI: 10.1177/0003122413481351
http://asr.sagepub.com

The Capitalist Machine: Computerization, Workers' Power, and the Decline in Labor's Share within U.S. Industries

Tali Kristal[a]

Abstract

This article addresses an important trend in contemporary income inequality—a decline in labor's share of national income and a rise in capitalists' profits share. Since the late 1970s, labor's share declined by 6 percent across the U.S. private sector. As I will show, this overall decline was due to a large decline (5 to 14 percent) in construction, manufacturing, and transportation combined with an increase, albeit small (2 to 5 percent), in labor's share within finance and services industries. To explain the overall decline and the diverse trends across industries, I argue that the main factor leading to the decline in labor's share was the erosion in workers' positional power, and this erosion was partly an outcome of class-biased technological change, namely computerization that favored employers over most employees. I combine data from several sources to test for the independent effects of workers' positional power indicators (i.e., unionization, capital concentration, import penetration, and unemployment) and the direct and indirect effects of computer technology on changes in labor's share within 43 nonagricultural private industries and 451 manufacturing industries between 1969 and 2007. Results from error correction models with fixed-effect estimators support the study's arguments.

Keywords

computerization, income inequality, labor unions, labor's share

Capitalists' profits play a crucial role in the process of social stratification. Yet inequality research largely neglects the dynamics of national income distribution between capitalists' profits and workers' compensation, and focuses overwhelmingly on distributional issues within workers. Even studies on income inequality between social classes or on top income shares tend to identify the capitalist class as a subset of the self-employed. This approach ignores the fact that corporations, not individual business owners, dominate production for private profit in modern capitalist economies. To fill this lacuna in inequality research, I analyze income inequality between capitalists' profits and workers' income in U.S. industries over the past four decades, a period in which income inequality surged.

[a]University of Haifa

Corresponding Author:
Tali Kristal, Department of Sociology and Anthropology, University of Haifa, Haifa 31905, Israel
E-mail: kristal@soc.haifa.ac.il

Challenging the long-standing economic assumption regarding the constancy of labor's share of national income, which Keynes (1939:49) called "a bit of a miracle," recent studies show that over time, workers and capitalists do not benefit similarly from the fruits of economic growth. Across rich countries, labor's share increased in the aftermath of World War II. Similar to the case with earnings inequality, however, the past three decades have seen a reverse long-term trend toward increasing inequality between capitalists' profits and workers' compensation (Blanchard 1997; Kristal 2010). The main argument for rising income inequality, put forward by economists, is that computerization increases the productivity of machines and skilled workers; through the invisible hand of the market, this has led to rising inequality between capitalists and workers as well as among workers (Acemoglu 1998, 2002). Sociologists, by contrast, tend to emphasize social and power relations as driving inequality, both among workers (Alderson and Nielsen 2002; Kristal and Cohen 2007, 2012; Moller, Alderson, and Nielsen 2009; Moller et al. 2003; Sakamoto and Kim 2010; Volscho and Kelly 2012; Western and Rosenfeld 2011) and between capitalists and workers (Korpi 2002; Kristal 2010, 2013; Lin and Tomaskovic-Devey forthcoming).

In this article I draw on stratification theories that stress power relations in the study of income inequality to explain inequality between capitalists' profits and workers' compensation. I argue that the degree of income inequality is primarily a function of classes' positional power, and that both sides utilize their relative strength to bargain over a larger slice of the national income pie. The longitudinal data on U.S. industries that I use in this study allow for a fruitful contribution to the debate over the causes of rising inequality. These data make it possible to conduct a first empirical test for the effects of computer technologies and indicators for classes' positional power (i.e., unionization, unemployment, capital concentration, and import penetration) on labor's share.

This article makes a further contribution to the study of income inequality by clarifying the question regarding the mechanisms through which computerization affects inequality. Economic studies assume that the negative relations between computers and labor's share are an outcome of a single mechanism, specifically the increase in machine productivity relative to workers' productivity. Consequently, previous studies have (1) overlooked the structurally antagonistic social relations between capitalists and workers and (2) not resolved the puzzle, which this study reveals, regarding the decline of labor's share only in *some* industries (construction, manufacturing, and transportation), despite the massive flow of computer technologies across *all* industries. To redress these shortcomings, I argue for an additional mechanism whereby the diffusion of computer technology across workplaces has translated into a decline in labor's share through exacerbated union decline; therefore, the term "class-biased technological change" may best describe the relations between computerization and labor's share.

I will first describe labor's share at the aggregate country level and its diverse trends across industrial sectors over the postwar period. The downward trend in labor's share is very evident in European countries but relatively moderate in the United States, leading to speculation on whether the United States is an exceptional case (Dew-Becker and Gordon 2005). To disclose the dynamics of labor's share in the United States, I employ several operational measures for labor's share at the aggregate country level, demonstrating that since the late 1970s labor's share declined by 6 percent over the entire U.S. private sector. I then provide a first description of labor's share across broad industries over the post-World War II period. My basic assumption is that measuring labor's share in the aggregate economy probably masks important shifts among sectors and industries, which may either offset or amplify changes in the overall size of labor's share. In fact, based on industry data, Solow (1958:619) argued that the long-standing neoclassical economic assumption regarding the constancy of labor's share is at least partially a "mirage." The first part of the article reinforces Solow's proposition by showing a clear and large decline in labor's share within construction, manufacturing, and transportation industries, and an increase, albeit small, within finance and services.

I then introduce the class positional power approach to labor's share and explain how computerization and the erosion of workers' bargaining power relate to the decline in labor's share. In the first part of the findings, I analyze the effects of indicators for technological change and workers' bargaining power on changes in labor's share in 43 nonagricultural private industries and 451 manufacturing industries between 1969 and 2007. In the second part of the findings I go on to test whether computerization affects *wages* as it affects labor's share. Specifically, I test whether computerization increased skilled workers' wages more than less-skilled workers' wages and more than capitalists' profits, as claimed by the skill-biased technological change (SBTC) hypothesis for rising wage inequality. I conclude that over the past 30 years, (1) institutional changes contributed more to rising inequality by eroding most workers' bargaining power and (2) one mechanism through which computerization decreased labor's share (and increased wage inequality) was class-biased technological change, which favored capitalists and high-skilled workers while eroding most rank-and-file workers' bargaining power.

MEASURING LABOR'S SHARE

Stratification research usually focuses on inequality in wages and salaries, largely neglecting the idea that capitalists' profits play a crucial role in the process of social stratification. According to national accounts data, wages and salaries account for only about half of the total income generated in the economy (see Figure 1A). A large and increasing share of national income is in the form of capital income, including gross profits of financial and nonfinancial firms, interest, and rent. By taking into account all income sources, national accounts data allow us to measure income inequality between aggregate categories of the working and capitalist classes.

In a stylized Marxian manner, I define capitalists as people who own and control the capital used in production, and workers as all employees excluded from such ownership and control. This leads to measuring income inequality between workers and capitalists by the respective shares of national income going to labor (wages, salaries, and fringe benefits) versus capital (gross firms' profits, interest, dividends, and rent).[1] Using national accounts data to measure income inequality between capitalists and workers likely conceals differentiations and divisions within classes. Moreover, methodological and conceptual difficulties are associated with using national accounts data to assess the amount of capital income obtained by workers or the part that derived from financial profits. Nevertheless, national accounts data clearly portray a central dimension of inequality in the polarized class relations of capitalism.

One possible criticism of analyzing the distribution of national product between capitalists and workers is the popular notion that in today's world there is no longer any simple correspondence between classes of people and sources of income. Some argue that we can no longer identify the working class with the receipt of wages and the capitalist class with the receipt of profits. A person may work for IBM, for example, and own some shares in the company as well. Indeed some workers, mainly top executives, obtain not only wages but also capital income in the form of dividends, interest on deposits, or rent from second homes.[2] Yet previous studies show that including top earners with the working class does not bias the analysis (Kristal 2010, 2013). Additionally, workers' share of total capital income is relatively minor. Based on the Federal Reserve Board's Survey of Consumer Finances, I estimated that only 8 percent of total capital income in 2007 went to

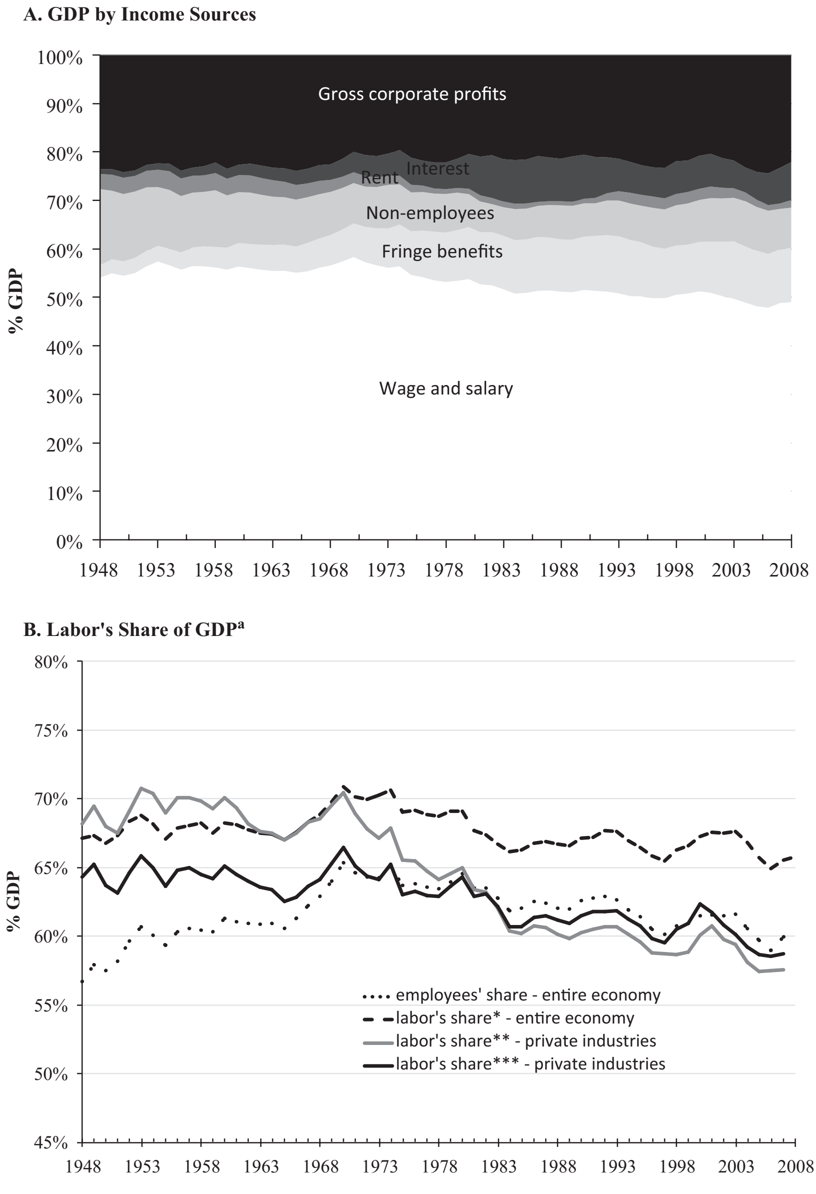

Figure 1. Shares of Different Sources of Income in U.S. National Income, 1948 to 2008
Source: Bureau of Economic Analysis (BEA) National Income and Product Accounts Tables (n.d.).
[a]Employees' share is measured as the percentage of GDP (at basic prices) that goes to compensate employees (wage, salary, and fringe benefits). Labor's share is measured by dividing employees and self-employed labor income by GDP. In the first series (labor's share*), I estimated the labor income of the self-employed by allocating two-thirds of proprietors' income to labor earnings and one-third to capital income. In the second series (labor's share**), I calculated the labor income of the self-employed by multiplying the number of self-employed workers by the average wages of wage and salary workers. Finally, in labor's share***, I estimated the labor income of the self-employed according to the average wages in their industry.

families in the form of dividends or interest from deposits. Almost all capital income, therefore, is made up of gross profits from financial and nonfinancial corporations.

A further issue with respect to how closely labor and capital incomes are associated with class division in contemporary capitalism is financialization, which means that accumulation is now increasingly accomplished through financial channels, rather than through trade and commodity production, largely reflecting a growth in interest income (Epstein and Jayadev 2005; Krippner 2005; Tomaskovic-Devey and Lin 2011). The fact that financial profit-making depends more on rates of return in financial markets and less on extraction of surplus value from labor, as in the case of production profits, might lead one to assume that financial profits are class-neutral. Yet the evidence runs counter to this assumption, revealing that capitalists are the main beneficiaries of financialization. We know that nearly all yields from financial assets accrue to capitalist owners of one kind or another, in particular to bankers with the rise of real interest rates. In nonfinance industries, too, Lin and Tomaskovic-Devey (forthcoming) come to the same conclusion. By allocating total capital income between financial profits (interest, dividends, and capital gains) and production profits (gross profits from sales of goods and services) based on IRS data, Lin and Tomaskovic-Devey find that an increase in the ratio of financial to production profits led to a decline in labor's share. Hence, the fact that national accounts data include financial and production profits in overall capital income does not nullify or diminish the advantage of using these data to portray a central dimension of inequality between workers and capitalists.[3]

Figure 1B displays labor's share (wages, salaries, and fringe benefits) of national income for the extended period between 1948 and 2008. As is commonly done (Gollin 2002; Krueger 1999), I estimated the *labor portion* of self-employed income by allocating two-thirds of proprietors' income to labor earnings (labor's share*) or by multiplying the number of self-employed by the average wages per employee (labor's share**). Because most of the self-employed are concentrated in agriculture and construction industries, where average wages are lower than in other industries, I re-estimated labor income of the self-employed according to the average wages in their industry (labor's share***).[4] The last series best describes, in my opinion, the distribution of national income between workers and capitalists.

Three well-known stylized facts are evident in Figure 1B. First, labor's share increased gradually from the end of World War II until the late 1960s. Second, labor's share has declined by almost six percentage points since the early 1970s. Third, in the short term, labor's share decreased with rapid economic growth, high rates of unemployment, and rising prices (Raffalovich, Leicht, and Wallace 1992). Yet we should bear in mind that labor's share in the aggregate economy is a weighted average of its respective shares in the various industrial sectors. In the next section, I disaggregate labor's share by industries to better understand the overall trend of decline.

LABOR'S SHARE ACROSS INDUSTRIAL SECTORS

Figure 2 presents labor's share for eight broad private industrial sectors. Measuring labor's share across industries reveals that the trend of decline in transportation began in the late 1940s and intensified in the 1970s. Since the mid-1970s, labor's share decreased by 14 percentage points in manufacturing, 10 percentage points in transportation, and five in construction. During the same years, agriculture, FIRE (i.e., finance, insurance, and real estate), and services industries saw an opposite trend, in which labor's share moderately increased by two to five percentage points.[5] The downward trend in some industries and the upward trend in others sums to a decline of six percentage points in the overall distribution of labor's share. Thus, the current debate over whether labor's share in the

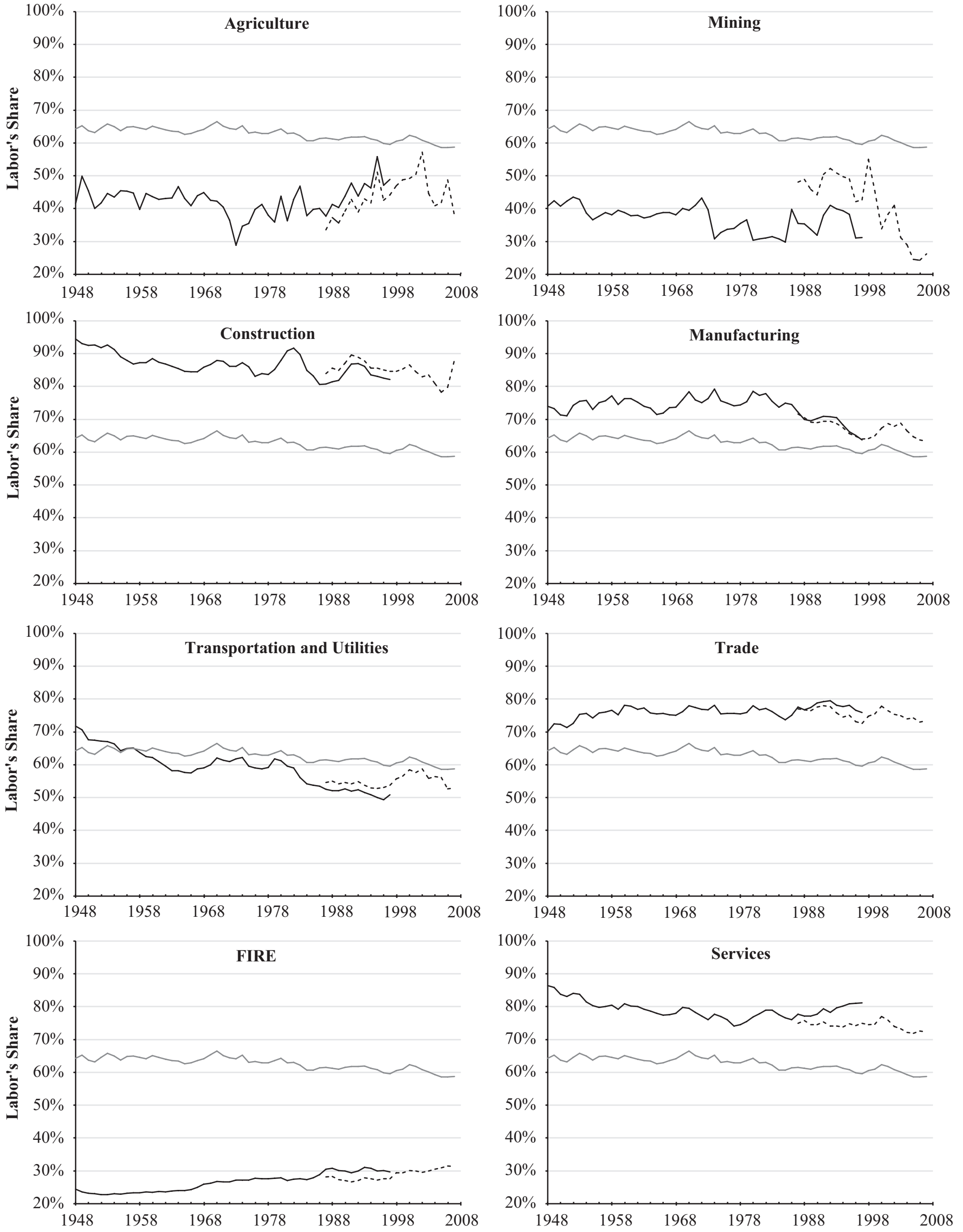

Figure 2. Labor's Share in Private Industries[a] (gray line) and by Industrial Sector[b] (black line), 1948 to 2007

Source: BEA Industry Economic Accounts (n.d.).

[a]Excluding government, service-sector aggregates with substantial government employment (e.g., healthcare and educational services), and private households.

[b]It is not possible to provide comparable time-series trends by industrial sectors for the entire 1948 to 2007 period. Starting in 1997, the Census Bureau shifted to a new industry classification structure, the North American Industry Classification System (NAICS), which replaced the 1987 Standard Industrial Classification (SIC) system. Recently, the Bureau of Economic Analysis published industry data according to the NAICS classification back to 1987, which makes it possible to estimate labor's share for broad industrial sectors over two long periods: 1948 to 1997 (SIC in the solid line) and 1987 to 2008 (NAICS in the broken line).

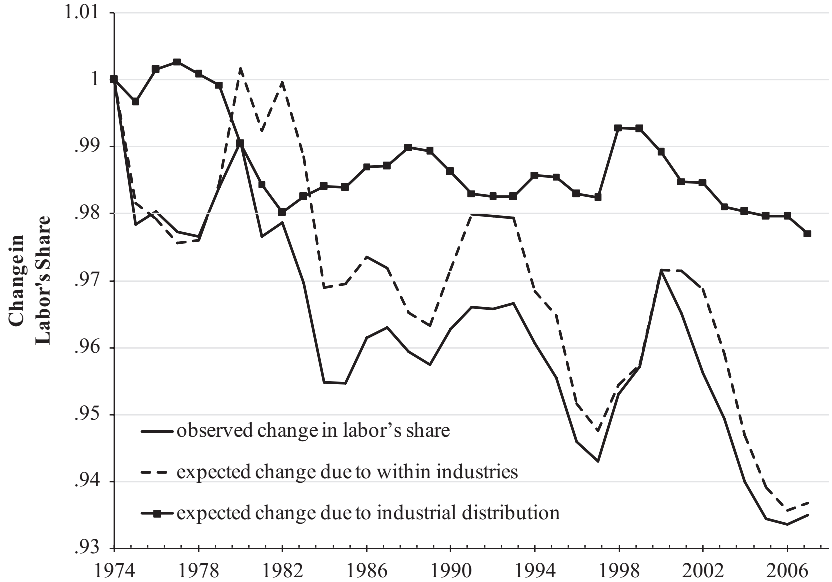

Figure 3. Decomposition of the Change in Labor's Share between 1974 and 2007 (1974 = 1)
Source: BEA Industry Economic Accounts (n.d.).
Note: I calculated the expected change in labor's share due to changes within industries by holding constant the industrial distribution. Specifically, for each industrial sector I weighted labor's share in each year by its product share in 1974 and then summed the results for all industries. I calculated the expected change in labor's share due to changes in the industrial distribution by holding constant labor's share within industries. Specifically, for each industrial sector I weighted its product share in each year by the level of labor's share in 1974 and then summed the results for all industries.

United States has moderately declined or stayed constant over the past decades overlooks critical evidence. Measuring labor's share across broad industrial sectors reveals that the core industries experienced a large decline in workers' share of production output and a rise in capitalists' share.

Based on the variance in absolute levels of labor's share between industries (high in construction, manufacturing, trade, and services, but low in agriculture, mining, and FIRE), one might presume that a broad shift in the economy's sectoral composition, in particular the decline in manufacturing employment and the financialization of the U.S. economy, could induce an aggregation bias in the aggregate labor's share. I assess this structural explanation for the decline in labor's share by asking the following counterfactual question: If the within-sector labor's share had remained constant over time while the industrial distribution was allowed to change, by how much would labor's share have declined? Figure 3 presents results from this accounting exercise and shows that if only the industrial distribution had changed then labor's share would have fallen by only two percentage points. However, if only labor's share within industries had changed, then labor's share in the entire economy would have fallen by six percentage points, which is the observed total decline in labor's share. This being the case, it is evident that most of the observed decline in labor's share was due to changes within industries rather than to shifts in the size of industries.

EXPLAINING THE DYNAMICS OF LABOR'S SHARE

Classes' Positional Power and Income Distribution

Mainstream neoclassical economic theory conceives of labor market processes as outcomes of free exchange in the competitive market, but sociologists have pointed out that social and power relations between labor market actors are crucial to the nature of the market and, more importantly, to its outcomes. The study of how power relations determine income includes extensive examination of the relative power of positions—empty places in the social structure—and their related material rewards. Some of these conceptions focus on class relations (Wright and Perrone 1977) or occupational groups' power (Grusky and Sørensen 1998; Weeden 2002); others focus on employers' versus employees' bargaining power (Esping-Andersen 1985; Hicks 1999; Korpi 1983; Stephens 1979).

Following these studies, my basic assumption is that the degree of income inequality is largely a function of the power relations that constrain and regulate the process of income acquisition and distribution. Specifically, I argue that the income distribution process between capitalists and workers is primarily a function of classes' positional power, and that both sides utilize their relative strength to bargain over a larger slice of the income pie. I assume, first, that classes' positional power results from the historically specific distribution of rights and powers over the production process (Wright 1979), which may vary with, among other things, changes in ownership structure, prolongation of unemployment, and production technology. The second component of classes' positional power takes into account what Burawoy (1985) termed the "politics of production," stressing that workers' positional power depends on the effectiveness of political struggle against the power relations within production, such as union struggles over better wages and work conditions.

Computer Technologies

The general hypothesis regarding computerization holds that there is a negative empirical association between new computer technologies and labor's share.[6] Whereas most work in economics focuses on mechanisms that link technology use to workers and physical capital productivity and hence to their relative income shares (summarized below under *factor-biased technological change*), I argue for additional mechanisms that link technology use to classes' positional power in the labor process and hence to their relative income shares (summarized below under *class-biased technological change*). In particular, I argue that computerization is one cause of organized labor's decline, its influence channeled through (1) downsizing of unionized manufacturing jobs, (2) increased intensity of management anti-union actions, and (3) skill polarization of the workforce that undermines worker solidarity.

To be sure, arguing for a negative relation between computerization and labor's share in the first instance contradicts an abundance of evidence documenting a strong correlation between adoption of computer-based technologies and wages of college-educated labor (Autor, Katz, and Krueger 1998; Berman, Bound, and Griliches 1994; Krueger 1993). It may also challenge arguments that computer technology's complementariness with human capital (Acemoglu 1998) up-skills some computer professionals and engineers (Vallas and Beck 1996), or the idea that computers enhance access to labor-market information and serve as a signal of competence (DiMaggio and Bonikowski 2008), thereby increasing individual earnings. Yet while previous studies focus on computer technology's positive effect on individual workers' earnings, I am interested in computer technology's effect on workers' aggregate income relative to capitalists' income.

Factor-biased technological change. The factor-biased technological change (hereafter FBTC) argument (occasionally named capital-biased technological change) suggests that new computer technologies are not factor-neutral: they benefit physical capital (i.e., machine and equipment) productivity more than labor productivity. In turn, this has sparked a faster rise in capital income than in labor income (Acemoglu 2002, 2003; Bentolila and Saint-Paul 2003; Blanchard 1997). The FBTC argument has two related hypotheses. First, new technologies enjoy a relative complementariness with physical capital, meaning that due to computer technologies, machines and other equipment have become much more productive than workers. Second, this complementariness with physical capital has prompted firms to gradually reduce their demand for labor. A demand shift favoring machines over workers in the production process can result in (1) firms using more machines and equipment for tasks previously performed by workers to maximize productivity, thereby decreasing labor costs and labor's share of income from an industry's product,[7] or (2) firms maintaining the same level of production mix (i.e., the quantity of fixed assets of plant and equipment relative to the amount of workers), thereby keeping labor costs constant while the overall income pie increases due to rising productivity of capital, which in turn leads to a decline in labor's share.

Class-biased technological change. Factor biases in technological change clearly could affect income distribution, but other biases may have been more important. As an additional explanation, I advance a class-biased technological change (hereafter CBTC) argument that also predicts negative relations between computer technology and labor's share. My argument differs from the FBTC argument by shifting the spotlight from factors productivity to classes' positional power in the labor process. I expect that computer-based technologies are not class-neutral but embody essential characteristics that favor capitalists (and high-skilled workers), while eroding most rank-and-file workers' bargaining power. In particular, I argue that computerization has reduced labor's share *indirectly* through its role in reducing unionization. This is in contrast to the FBTC hypothesis that computerization has reduced labor's share *directly*.

Why might computer technologies have led to a decline in labor unions? The first plausible mechanism is that automation of the production process prompted firms to utilize computer equipment in tasks previously performed manually by blue-collar, mostly unionized workers, thus downsizing many unionized manufacturing jobs. Even in unionized workplaces where technological change is implemented in agreement with the union, workers often lose out; for example, following union-backed plant modernization at a General Motors automobile assembly plant, production workers experienced a sharp decline in employment when about a third of them lost their jobs (Milkman 1995).

The second plausible mechanism is that management's greater control due to the computer revolution empowered employers and management, allowing them to use more legal and illegal anti-union tactics, such as illegal discharge of union activists, surveillance of union leaders, mandatory captive-audience meetings with top management, and refusal to negotiate a collective agreement (Bronfenbrenner 2009). Previous studies show that computer technologies have enhanced employers' superior position in the labor process by augmenting their "technocratic control" (Burris 1993; Wallace and Brady 2001), a system in which employers and managers have the flexibility and coordinating features necessary to facilitate work (Burris 1998; Crowley et al. 2010; Vallas 1993; Zuboff 1988).[8] One outcome of employers' superior position in the labor process, I argue, is the evolution in sophistication and intensity of their anti-union tactics, designed to intensely monitor and punish union activity.

An additional mechanism links computer technology to skill polarization of the workforce, which undermines established workers' solidarity, thereby reducing the likelihood of working-class cohesion and collective action. Studies show that new computer technologies have had highly polarizing effects on the workforce: skilled workers experienced up-skilling, while many production workers underwent de-skilling (Burris 1998; Vallas and Beck 1996). This skill polarization deepened divisions among workers and most likely sapped the social and organizational bases on which workers' collective resistance might grow. U.S. workers' skill polarization with the influx of Information and Communication Technologies (ICT) has thus undermined workplace relations as the source of worker solidarity and thereby weakened the labor movement.

The CBTC hypothesis that computerization's effect on labor's share is channeled through unionization may solve the puzzle as to why the diffusion of computer technologies across all industries led to a decline in labor's share only in construction, manufacturing, and transportation. If computer technologies' effect on labor's share is partly channeled through the erosion of labor unions, as I argue, then industries where unionization was relatively high in the 1960s and 1970s, such as manufacturing, transportation, and construction, should have experienced a significant decline in labor's share. On the other hand, in industries where unionization was always low, such as finance, trade, and services, we should find only a weak direct effect of computers on labor's share, and the channeled effect should be marginal.

Workers' Relative Bargaining Power

Previous studies stress that the decrease in workers' bargaining power is the main potential explanation for the current decline in labor's share. Studies show that the more powerful and integrated are working-class organizations, the better able they are to counteract capitalists and shift the distribution of rents from firms to workers (Kalleberg, Wallace, and Raffalovich 1984; Kristal 2010, 2013; Rubin 1986; Wallace, Leicht, and Raffalovich 1999). Evidence points to a substantial rise in labor's share during the 1950s and 1960s due to workers having gained organizational power in the economic and political spheres. Since then, labor's share has declined in all rich countries, as labor unions and labor-affiliated political parties fell on lean times and workers were left without a strong collective voice to confront employers (Kristal 2010).

In the United States, trade union organizations that empower workers' militancy are particularly important to working-class power. During the 1940s and 1950s, unionization was widespread among private-sector production workers, in particular in the manufacturing, construction, mining, and transportation industries, and collective bargaining emerged as the industrial workplace norm. Although the U.S. labor movement is generally characterized as business unionism rather than social movement unionism, especially after defeat of the "red" unions in the early years of the Cold War (Stepan-Norris and Zeitlin 2003), U.S. labor unions have had a significant effect on workers' well-being. In fact, studies show that U.S. trade unions increased not only wages and fringe benefits but also labor's share of national income, at least until the 1970s (Henley 1987; Kalleberg et al. 1984; Macpherson 1990; Rubin 1986; Wallace et al. 1999).

In the past three decades the social contract between capital, labor, and the state has been broken, most likely affecting the dynamics of labor's share. Union density has been in decline since reaching its peak in the mid-1950s. In the private sector, union density has dropped from one-in-four wage and salary workers being union members in the early 1970s to below one-in-thirteen today (Western and Rosenfeld 2011). Unions declined as jobs shifted from unionized, core industries to less unionized, service industries (Farber and Western 2001). Unions also found themselves under relentless attack from employers using legal and illegal anti-union tactics (Bronfenbrenner 2009), the anti-union Reagan administration (Tope and Jacobs 2009), and labor legislation that had powerful, negative implications for the labor movement (Jacobs and Dixon 2006; Wallace, Rubin, and Smith 1988). Although some unions have recently countered the organizing trend of the 1980s and pursued industry-wide organizing (Voss and Sherman 2000), private-sector density grew only very recently, in 2007 (Southworth and Stepan-Norris 2009).

Unionization is important for the dynamics of labor's share, but it does not fully capture workers' relative bargaining power. What is missing here is capitalists' power, that is, their ability to exert control over product and labor markets as well as the production process itself. Capitalists' monopoly power, in particular, generally augments corporate capitalists' market power and enables them to increase their profits through their control over pricing mechanisms and to gain monopoly rents in the form of political influence (Jacobs 1988). As political economist Kalecki (1938) noted, an increase in the degree of monopoly power might result in a reduced share of national income accruing to wage-earners. This long-standing argument is supported by only little empirical evidence, from the printing industry between 1946 and 1978 (Kalleberg at al. 1984) and manufacturing industries in 1972 (Henley 1987).

I suggest that, all else being equal, augmentation of capitalists' power within industries may increase average workers' compensation due to mechanisms such as an internal labor market and labor unions (Kalleberg and Van Buren 1996), but it will decrease workers' share of industry income relative to capitalists' profits. The simplest way for employers to decrease product market competition is to purchase other firms, as was frequently done in the merger waves of the late 1960s and mid-1980s (Stearns and Allan 1996). Although economy-wide concentration levels in the private sector have not increased since the 1960s (White 2002), it might be the case that aggregate economy data mask important shifts among industries that may offset changes in capital concentration. We have seen, for example, a pattern of increasing concentration in the automobile, airline, petroleum production, motion-picture distribution, microcomputer, steel, tire, and wine industries, to name just a few.

The final component of workers' relative bargaining power is more global and relates to U.S. trade with low-wage countries. As U.S. trade barriers have fallen in recent years, low-wage countries like China and India have begun exporting to the United States many of the more labor-intensive products (e.g., t-shirts and sneakers) formerly produced domestically. This import penetration places U.S. workers in direct competition with lower-paid workers in developing countries. Competition curbs workers' bargaining power, brings down the wages of the least-skilled U.S. workers (Wood 1994), increases earnings inequality among workers (Alderson and Nielsen 2002), and reorients manufacturing activity toward capital-intensive plants (Bernard, Jensen, and Schott 2006). Therefore, although importing manufactured goods from less-developed countries increases the economy's income, it does not translate into a rise in average earnings and thus decreases labor's share (Kristal 2010).

DATA, VARIABLES, AND METHOD

Data and Variables

I tested the effect of computer technology and workers' bargaining power factors on labor's share using longitudinal data on U.S. industries. I used a pooled cross-sectional time-series design (i.e., yearly observations for each industry) to test the study's arguments. The combined industry-year datasets include 43 comparable (two-digit) industries that cover the entire nonagricultural private sector. Due to the major change in the industry classification structure in 1997, I have one dataset for the years 1969 to 1997 and another dataset for the years 1988 to 2007. I also collected data only for manufacturing industries, and this third database includes data on 451 (four-digit) manufacturing industries for the years 1977 to 2002. It is impossible to analyze earlier data because information on unionization by two-digit industry is available only from 1968 onward, and data on computer investments by four-digit industry is available only from 1977.

Analyses are based on data drawn from several governmental and census publications on U.S. industries. I combined data on labor's share and the magnitude and composition of each industry's capital investments from the Bureau of Economic Analysis (BEA) Industry Economic Accounts data and the Annual Survey of Manufactures (ASM), with data on unionization and unemployment from Current Population Survey (CPS) samples and the Bureau of Labor Statistics (BLS), data on capital concentration from the Census of Manufacturing (CM), and data on import penetration from Schott (2010). A full description of these data sources can be found in the Data Appendix.

I followed previous studies and measured *labor's share* by dividing labor income by an industry's value added (Gollin 2002; Krueger 1999). Value added is net of indirect taxes and is allocated as either labor income or capital income. Labor income includes compensation to employees and self-employed individuals' imputed income, based on the average wage in their industry; capital income includes the self-employed's residual income and firms' profits. I employed a simple measure of *computer technology* by measuring real investments in computers and software as a share of total investments. Although the BEA and Census industry data do not directly measure the kind of technology implemented in the production process, I assumed that when firms invest in computing equipment they are most likely to use it at different stages of the production process. I measured *union density* by dividing the number of union members in each industry by the number of wage and salary workers. *Unemployment* is measured by dividing the number of unemployed in each industry by the number of employed and unemployed persons.[9] *Capital concentration* data are available only for manufacturing industries from the CM, and the measure consists of the ratio of sales by the four largest firms to the total volume of sales in each industry. I used import data by industry and country to measure imports in manufacturing industries originating in low-wage countries. I measured *import penetration* by imports from low-wage countries as a share from industry's value added. Table 1 shows descriptive statistics for all variables.

Method

I analyzed the determinants of labor's share in time-series cross-sectional dynamic specification (a lagged dependent variable is included among the predictors) by fixed-effects estimators. Fixed-effects estimators, which exploit within-industry variation as a means of purging unit heterogeneity, make it possible to obtain unbiased and consistent estimates of parameters when industry effects are arbitrarily correlated with measured explanatory variables (Halaby 2004). By applying fixed-effects estimators, the models focus on within-industry variation over time, and coefficients represent a cross-industry average of the longitudinal effect. This estimation strategy is most appropriate to the current study because (1) the overall decline in labor's share was due to a decline within industries, and (2) the study's arguments for a positive effect of unions on labor's share and a negative effect for computer investments, unemployment, capital concentration, and import penetration apply to dynamics within all included industries, whereas the diverse trends across industries are explained by different levels of the independent variables, mainly unionization.

To estimate the long- and short-run effects of indicators for computer technology and workers' bargaining power on labor's share, I analyzed single-equation error correction models (ECMs)[10] that can accommodate stationary and nonstationary variables, given that the errors are stationary (Beck and Katz 2011; De Boef and Keele 2008).[11] Indeed, no statistical testing is required to see that the variables observed annually for relatively short periods trend over time and do not reach equilibrium. There are very few cycles in labor's share, unionization, or computer investments over the past 40 years, and the data series seem to be integrated (i.e., nonstationary).[12] The fact that the data series are nonstationary does not rule out a long-run equilibrium relationship. It may be the case that the data series are cointegrated; that is, the dependent and independent variables maintain a long-run error correction relationship (Engle and Granger 1987). To test whether the data series are cointegrated, I performed the standard two-step cointegration test by regressing Y on X (in levels) and then testing whether the residual is stationary. Based on the results (see Table A1 in the Appendix), we can reject the null of no cointegration for almost all variables in all datasets, concluding there are long-run relationships between the variables. Only the null of no

Table 1. Descriptive Statistics of Relevant Variables

Sector	Private Industries		Manufacturing Industries	
N industries	43	43	451[a]	393
Years	1969 to 1997	1988 to 2007	1978 to 2002	1978 to 2002
Dependent Variables				
Labor's Share (%)				
Mean (SD)	68.8 (17.9)	62.2 (16.9)[b]	48.4 (13.8)	47.6 (13.9)
Minimum–maximum	5.3–103.8	5–92.9	3.3–106.0	3.3–106.0
Mean annual change (SD)	–.260 (4.09)	–.186 (3.32)	–.291 (5.43)	–.273 (5.37)
Source	BEA	BEA	ASM	ASM
Skilled Wage-Bill Share (%)				
Mean (SD)	35.7 (16.4)	47.4 (17.6)	37.1 (12.0)	37.8 (12.1)
Minimum–maximum	5.7–88.4	11.2–92.8	.0–83.1	.0–83.1
Mean annual change (SD)	.818 (4.35)	.711 (4.69)	.243 (2.43)	.255 (2.40)
Source	BEA, CPS	BEA, CPS	ASM	ASM
Skilled Income Share (%)				
Mean (SD)	19.6 (10.3)	27.4 (13.2)	17.7 (7.5)	17.8 (7.6)
Minimum–maximum	1.2–64.8	2.3–72.2	.0–83.0	.0–83.0
Mean annual change (SD)	.101 (3.92)	.359 (3.26)	.015 (2.63)	.024 (2.58)
Source	BEA, CPS	BEA, CPS	ASM	ASM
Unskilled Income Share (%)				
Mean (SD)	45.6 (16.4)	31.6 (15.3)	30.9 (11.1)	30.1 (11.1)
Minimum–maximum	3.0–88.7	1.7–70.1	2.1–100	2.1–100
Mean annual change (SD)	–.294 (4.51)	–.552 (3.14)	–.303 (3.76)	–.293 (3.68)
Source	BEA, CPS	BEA, CPS	ASM	ASM
Independent Variables				
Ratio of Computer Investment to Total Investment (%)				
Mean (SD)	6.3 (8.2)	18.4 (13.9)	6.2 (7.4)	6.2 (7.2)
Minimum–maximum	0–51.0	.4–66.0	0–117.2	0–103.3
Mean annual change (SD)	.552 (1.32)	.415 (2.23)	.288 (3.98)	.293 (3.67)
Source	BEA	BEA	ASM	ASM
Unionization (%)				
Mean (SD)	24.2 (18.0)	15.6 (14.6)	21.5 (12.4)	21.3 (12.1)
Minimum–maximum	0–83.9	.2–80.5	0–100	0–100
Mean annual change (SD)	–.440 (2.40)	–.407 (1.72)	–.806 (4.56)	–.803 (4.62)
Source	CPS, BLS	CPS, BLS	CPS	CPS
Unemployment (%)				
Mean (SD)	6.3 (3.6)	5.5 (2.9)	7.1 (4.6)	7.0 (4.6)
Minimum–maximum	.2–26.4	.1–21.4	0–56.2	0–56.2
Mean annual change (SD)	.056 (2.6)	–.114 (2.19)	.001 (4.5)	–.001 (4.6)
Source	CPS	CPS	CPS	CPS
Capital Concentration (%)				
Mean (SD)			39.2 (20.5)	39.6 (20.5)
Minimum–maximum			2–100	2–100
Mean annual change (SD)			.211 (1.47)	.203 (1.47)
Source			CM	CM
Import Penetration (%)				
Mean (SD)				20.2 (141.5)
Minimum–maximum				0–5,984
Mean annual change (SD)				3.01 (41.9)
Source				Schott, ASM
N	1,247	860	11,269	9,819

Note: BEA = Bureau of Economic Analysis; ASM = Annual Survey of Manufacture; CPS = Current Population Surveys; BLS = Bureau of Labor Statistics; CM = Census of Manufacturing.
[a]Data are not available for eight manufacturing industries that changed classification in 1996.
[b]Labor's share for 1988 to 2007 was calculated without taking into account the move of self-employed to wage and salary employment due to lack of consistent data on self-employed and wages. This may have biased results for the service sector.

cointegration between computer investments, union density, and labor's share for the years 1988 to 2007 cannot be rejected. This suggests we need to be more careful with interpretation of the coefficients of the lagged levels for these two variables during the years 1988 to 2007. Because these coefficients are not statistically significant, it does not affect the reading of the findings.

The ECMs' parameterization has the advantage of explicitly modeling both short- and long-run effects on labor's share, providing easily interpretable estimates of these parameters, which makes these models particularly appropriate in the context of this study. For example, the ECMs make it possible to estimate two effects of unionization on labor's share: one that occurs immediately with a decline in union density, and another that is dispersed across future time periods with the erosion of labor unions. I therefore specify the time-series cross-section variant of the single-equation error correction model for the dynamic relationships:

$$\Delta labor's\_share_{i,t} = \alpha_0 + \beta_1 \Delta X_{i,t} - \beta_2 \left(labor's\_share_{i,t-1} - \beta_3 X_{i,t-1} \right) + \varepsilon_{i,t}$$

In this model, current changes in labor's share (measured in first difference, i.e., $Y_t - Y_{t-1}$) are a function of both short-term changes (i.e., first differences) in the independent variables and their long-term levels. Specifically, β_1 captures any short-term effects on labor's share, and long-term effects are captured by β_3. The long-term effect occurs at a rate dictated by the value of β_2 that captures the rate of return to equilibrium. By dividing the coefficient of the lagged-level variables by the coefficient of the lagged labor's share, we get the long-term multiplier that represents the total long- and short-term effect on labor's share for a one-point increase in the independent variable. In all models, estimates are weighted by industry size to make sure results are not biased by small industries representing only a small fraction of the total product.

EMPIRICAL ANALYSES OF LABOR'S SHARE DYNAMICS WITHIN INDUSTRIES

Using the methods described in the preceding section, I modeled the change in labor's share within industries as a function of short-term changes (i.e., first differences) and long-term levels (i.e., lagged values) of industry-level measures of workers' bargaining power and computer utilization. To control for year-specific economy-wide shocks, the models include a dummy variable equal to 1 for recession years (1969 to 1970, 1973 to 1975, 1980 to 1982, 1990 to 1991, 2001, and 2007), which captures effects of periodic expansion and contraction of output. The rationale is that during recession, labor's share should increase in the short-term because massive cuts in wages and employment are usually limited by institutional constraints, and firms' profits are the first to be negatively affected (Raffalovich et al. 1992).

I also tested for the effect of labor-affiliated government on labor's share in the U.S. context by including a dummy variable taking on a value of 1 in years with Democratic presidents and 0 when Republicans held the presidency. Results were not statistically significant (data not shown). Table 2 shows results for two-digit private sector industries (Models 1 through 4), two-digit core industries (Models 5 through 8), and four-digit manufacturing industries (Models 9 through 12). To illustrate the dynamic pattern of relations, Figure 4 plots their lag distributions for the core (Models 5 and 6) and manufacturing (Models 11 and 12) industries. The lag distribution, presented by the comparable semi-standardized coefficients, is the amount by which labor's share changed each year, expressed in percentage points, in response to an increase in one standard deviation of the independent variable.[13]

Overall, I found empirical support for my argument that higher levels of workers' bargaining power redistribute income toward the

Table 2. Unstandardized Coefficients from Single Equation ECM, Dependent Variable Is Annual Change in Labor's Share

Dependent Variable	Δ Labor's Share											
Sector	Nonagricultural Private Sector				Core Industries				Manufacturing			
N of industries	43		43		28		24		451		393	
Years	1969 to 1997		1988 to 2007		1969 to 1997		1988 to 2007		1978 to 2002		1978 to 2002	
Model	1	2	3	4	5	6	7	8	9	10	11	12
Δ Computer investments	–.077	–.051	.023	.028	–.348**	–.299**	–.106	–.108	.019	.053**	.020	.054**
	(.066)	(.067)	(.043)	(.043)	(.120)	(.116)	(.128)	(.128)	(.021)	(.021)	(.024)	(.023)
Computer investments $_{(t–1)}$	–.005	.014	.013	.021	–.076	–.030	–.003	.018	–.094**	–.032	–.096**	–.034
	(.018)	(.015)	(.019)	(.018)	(.049)	(.049)	(.057)	(.053)	(.019)	(.028)	(.020)	(.029)
Δ Union density		–.020		–.009		–.014		.068		.066**		.064**
		(.078)		(.093)		(.093)		(.123)		(.019)		(.019)
Union density $_{(t–1)}$		.083**		.035		.061**		.031		.121**		.120**
		(.025)		(.039)		(.026)		(.052)		(.019)		(.020)
Δ Unemployment	.065	.069	.054	.049	.111	.119	.215**	.213**	.086**	.068**	.081**	.063**
	(.106)	(.106)	(.080)	(.080)	(.137)	(.135)	(.114)	(.112)	(.020)	(.020)	(.020)	(.021)
Unemployment $_{(t–1)}$	–.119**	–.108	–.145**	–.154**	–.128	–.115	–.039	–.044	.043	–.010	.034	–.017
	(.057)	(.064)	(.068)	(.065)	(.076)	(.087)	(.088)	(.083)	(.033)	(.036)	(.036)	(.039)
Δ Capital concentration									–.114**	–.108	–.115	–.114
									(.067)	(.070)	(.071)	(.074)
Capital concentration $_{(t–1)}$									–.023	–.017	–.019	–.014
									(.023)	(.019)	(.023)	(.019)
Δ Import penetration											.024**	.024**
											(.008)	(.009)
Import penetration $_{(t–1)}$											–.004**	–.003**
											(.002)	(.002)
Recession (dummy)	.796**	.677**	.257	.265	1.370**	1.223**	.895	.881	1.958**	1.671**	2.006**	1.730**
	(.271)	(.256)	(.218)	(.217)	(.351)	(.326)	(.538)	(.554)	(.242)	(.229)	(.258)	(.244)
Labor's share $_{(t–1)}$	–.211**	–.235**	–.246**	–.248**	–.227**	–.242**	–.244**	–.249**	–.240**	–.287**	–.231**	–.277**
	(.029)	(.025)	(.035)	(.037)	(.037)	(.032)	(.061)	(.065)	(.031)	(.028)	(.031)	(.028)
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	.156	.169	.173	.174	.193	.200	.173	.174	.167	.190	.170	.193
Modified DW	1.89	1.87	1.88	1.84	1.97	1.96	1.91	1.91	2.00	1.99	2.00	1.99
N	1,247		860		812		480		11,269		9,819	

Note: Each column represents a pooled regression of changes in labor's share. Table entries are OLS estimates. Robust standard errors in parentheses are heteroskedasticity and autocorrelation consistent. Estimates are weighted by mean industry share of total value added over the years. Δ indicates the annual change in the variable. Core industries include construction, manufacturing, and transportation.

**$p < .05$ (two-tailed test).

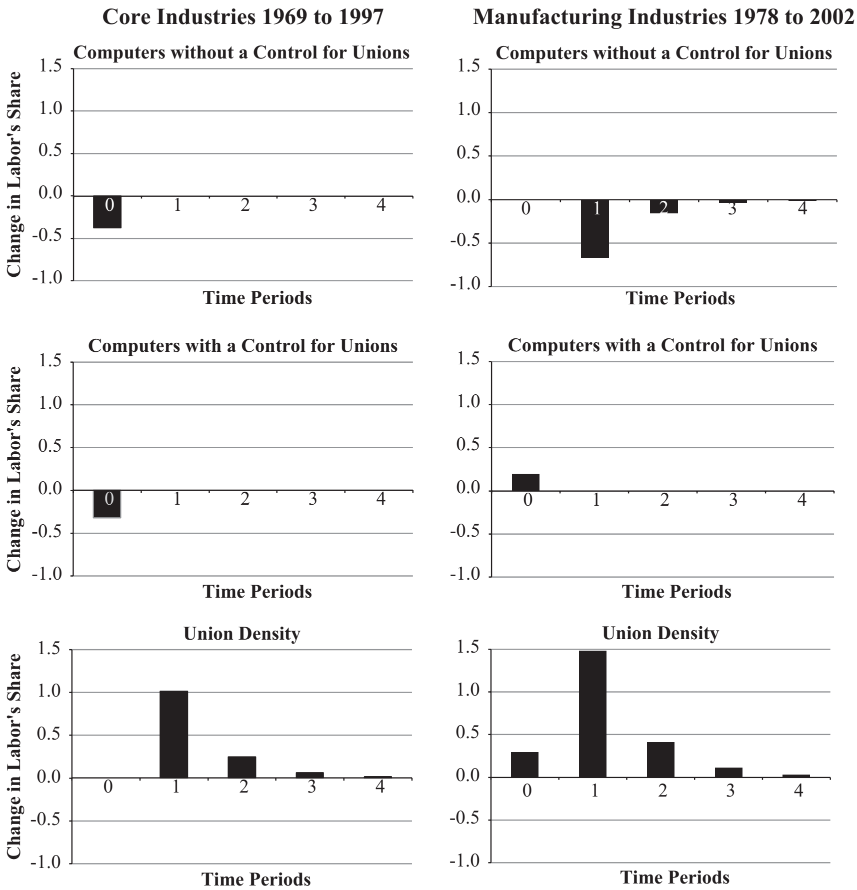

Figure 4. Estimated Lag Distributions for Change in Labor's Share Within-Industries
Note: Unstandardized regression coefficient multiplied by the sample standard deviation of the independent variable. This represents the change in *Y* over time after an increase of one standard deviation in *X*, in original units of *Y*.

working class. Results reveal that the decline in unionization, the rise in unemployment (in the entire private sector), and the importation of goods from less-developed countries all curbed the bargaining power of many workers over the past decades and led to a significant decline in labor's share. Union density, in particular, had a robust, long-term positive effect on changes in labor's share in all models except for the period 1988 to 2007, and an additional short-term positive effect in manufacturing. The effect of union regression on the decline in labor's share was substantial. The 14-perctange-point decline in union density in nonagricultural private industries (from 30 to 16) from 1969 to 1997 decreased labor's share by five percentage points, which was the overall decline in labor's share during these years. Also in manufacturing, union regression explains almost the entire decline in labor's share. The 20-perctange-point decline in union density in manufacturing industries from 1978 to 2002 depressed labor's share by 8.4 percentage points.

As expected, I found a negative long-run effect for unemployment on changes in labor's share in private sector industries that explains the overall decline of two percentage points in labor's share between 1988 and 2007. This negative effect of unemployment on labor's share indicates that an increase in labor's reserve army diminished labor's bargaining power over wages and benefits, thereby causing a decline in labor's share. Yet, contrary to my hypothesis, when I analyzed the more unionized core and manufacturing industries between 1988 and 2007, I found only a positive short-term effect for unemployment on changes in labor's share, suggesting that workers in the nonunionized sector bore the brunt of increasing unemployment.

I also found that importation of manufactured goods from less-developed countries increased labor's share in manufacturing industries in the short term, but decreased its share in the long term. The unexpected positive short-run effect of import penetration on labor's share might be due to short-run employment growth (Kristal 2010). In the long-run, however, import penetration increases the size of the national income pie without increasing wages, which leads to a decline in labor's share. Overall, the increase in import penetration from less than one percentage point in 1978 to more than 18 percentage points in 2002 decreased labor's share by .2 percentage points, most likely due to a slowdown in low-skilled workers' earnings and benefits. Finally, in most models for manufacturing industries I did not find the expected negative coefficient for the effect of capital concentration on labor's share. It may be the case that capital concentration's positive effect on capitalists' profits was offset by its positive effect on workers' compensation, in particular due to labor unions that thrived in monopolistic industries where employers could pass on higher labor costs to customers.

The findings for negative effect of computer technology on labor's share support the general argument of the FBTC and CBTC theories that utilization of computer technologies across workplaces decreased aggregate workers' compensation as a share of an industry's income, although only in core industries for the years 1969 to 1997. To better understand the link between computers and labor's share, I tested the validity of computers' direct effect (according to FBTC) or channeled effect (according to CBTC) through unionization on labor's share. Results in Tables 2 and 3 mainly support the CBTC theory of an indirect effect, but there is also some support for the FBTC argument.

First, and most important, although the diffusion of computer technology occurred in all industries, I found a significant negative effect for computer investments on changes in labor's share only within core (Models 5 and 6 in Table 2) and manufacturing (Models 9 and 11 in Table 2) industries. This finding suggests a channeled effect for computerization, because labor unions were relatively strong in core industries until the 1970s, while labor unions' power in other private industries, such as trade, FIRE, and services industries, was at no time substantial. Second, with addition of union density to the model, the effect of computers is significantly attenuated in core industries (Models 5 and 6 in Table 2) and becomes positive in manufacturing industries (Models 9 through 12 in Table 2).[14] Table 3 provides additional support for the CBTC argument by re-estimating Models 1 and 3 in Table 2 with an interaction dummy for unionization, where 1 denotes industries with a decline in union density of more than five percentage points and 0 denotes all other industries (mainly trade, FIRE, and services industries where unionization was always low). Results show that computers had a negative effect on labor's share only in industries where unionization declined and only when workers retained some organizational power.

COMPUTERIZATION AND INCOME DISTRIBUTION

All in all, I found empirical support for both of this study's arguments regarding the causes of the decline in labor's share. I consistently found a positive relation between indicators for workers' relative bargaining power (mainly unionization) and labor's share, and a negative relation between computer technologies and labor's share, channeled through the decline in unionization. At first glance, the

Table 3. Unstandardized Coefficients from Single Equation ECM, Dependent Variable Is Annual Change in Labor's Share

Dependent Variable	Δ Labor's Share	
Sector	Nonagricultural Private Sector	
N of Industries	43	43
Years	1969 to 1997	1988 to 2007
Model	1	2
Δ Computer investments x union declined	–.322**	.009
	(.110)	(.125)
Δ Computer investments x union constant	.009	.026
	(.063)	(.043)
Computer investments $_{(t-1)}$ x union declined	–.087	–.001
	(.049)	(.048)
Computer investments $_{(t-1)}$ x union constant	.008	.021
	(.014)	(.017)
Δ Unemployment x union declined	.136	.176
	(.124)	(.100)
Δ Unemployment x union constant	–.170	–.163
	(.116)	(.137)
Unemployment $_{(t-1)}$ x union declined	–.132**	–.068
	(.066)	(.087)
Unemployment $_{(t-1)}$ x union constant	–.079	–.309**
	(.112)	(.130)
Union declined (dummy)[a]	–2.497**	10.007**
	(.877)	(2.251)
Recession (dummy)	.839**	.217
	(.239)	(.218)
Labor's share $_{(t-1)}$	–.236**	–.247**
	(.027)	(.036)
Constant	Yes	Yes
Industry dummies	Yes	Yes
R^2	.181	.183
Modified DW	1.88	1.87
N	1,247	860

Note: Each column represents a pooled regression of changes in labor's share. Table entries are OLS estimates. Robust standard errors in parentheses are heteroskedasticity and autocorrelation consistent. Estimates are weighted by mean industry share of total value added over the years. Δ indicates the annual change in the variable.
[a]Union density declined by more than five percentage points.
**$p < .05$ (two-tailed test).

negative relation between computerization and labor's share is puzzling. If computer technologies increase educated workers' wages, as the dominant skill-biased technological change argument claims (Acemoglu 1998; Autor et al. 1998), how could computers have led to a decline in the aggregate workers' share of industry income? The answer is simple: computers benefited capitalists' profits more than educated workers' compensation (and, of course, more than less-skilled workers' compensation).

I tested this hypothesis by estimating the effect of computers on skilled workers' share of an industry's wage bill (relative to less-skilled workers) and their share of an industry's income (relative to less-skilled workers and capitalists). If computers increased skilled workers' share of an industry's wage bill, compared to that of less-skilled workers, but did not increase skilled workers' share of an industry's income, compared to that of less-skilled workers and capitalists, we may conclude that computer technologies benefited capitalists' profits more than skilled workers' compensation.

Data on manufacturing industries from the ASM make it possible to empirically test this hypothesis; Table 4 shows the results. I followed Berman and colleagues (1994) and Autor and colleagues (1998) in using the available information on production and nonproduction workers as indicators for education and skill levels. Nonproduction workers include managers above the line-supervisor level, as well as clerical, sales, office, professional, and technical workers. To analyze the effect of computerization on the wage-bill share and income shares of skilled and less-skilled workers in all private industries, I drew on data from the March CPS; Table 5 shows the results. I used the March files from 1969 to 2008 (covering earnings from 1968 to 2007) to compile a sample of annual earnings for wage/salary workers age 18 to 65 years who participated in the labor force on a full-time, full-year (FTFY) basis, defined as working 35-plus hours per week and 50-plus weeks per year. Skilled workers are defined according to their educational attainments and include college equivalents (college graduates plus half of those with some college); unskilled workers include noncollege (or high school) equivalents (half of those with some college plus workers with 12 or fewer years of schooling).

Results generally confirm my hypothesis and suggest the diffusion of computer technologies across workplaces was not only good for educated workers' income, but even better for capitalists' profits. The coefficient for computer investments is positive for skilled workers' share of the wage bill, compared to that of less-skilled workers (Models 1 and 2 in Tables 4 and 5), indicating that computers increased educated workers' relative wages, as argued by the SBTC hypothesis. However, the coefficient for computer investments is zero for skilled workers' share of an industry's income, compared to that of less-skilled workers and capitalists (Models 5 and 6 in Table 4 and Model 5 in Table 5), suggesting that computers did not increase skilled workers' wages and fringe benefits relative to capitalists' profits. The one exception is the positive effect for computer investments on skilled workers' share of an industry's income for the period 1988 to 2007 (Model 6 in Table 5), suggesting that computerization noticeably raised skilled workers' wages in the 1990s and early 2000s.

CONCLUSIONS AND DISCUSSION

This article marks advances on three fronts regarding the recent decline in labor's share and, more generally, enhances our understanding of the causes of rising income inequality in the past 30 years as well as the contemporary state of inequality. First, I showed that the aggregate trend of decline in U.S. labor's share by almost six percentage points since the early 1970s conceals diverse trends within industrial sectors. Measuring labor's share across broad industrial sectors reveals that the construction, manufacturing, and transportation industries saw a large decline in workers' share of production output and a rise in capitalists' share; in trade, FIRE, and services industries, labor's share stayed relatively constant or even increased. That labor's share declined only in core unionized industries, despite the massive flow of computer technologies across all industries, suggests that class conflict played a central role in the decline of labor's share.

Second, I further developed a power relations thesis, stating that the erosion in workers' positional power was the main factor leading to the decline in labor's share. This argument could be empirically tested with the industrial data utilized in this study, because these data make it possible to directly measure indicators not only for workers' power but

Table 4. Computer and Income Distribution in Four-Digit Manufacturing Industries, Unstandardized Coefficients from Single Equation ECM; Dependent Variables Are Annual Change in Skilled Workers' Wage-Bill Share and in Skilled and Unskilled Workers' Income Share

Dependent Variable	Δ Workers' Share in Industry's Wage Bill		Δ Workers' Share in Industry's Income			
Class	Nonproduction Workers		Production Workers		Nonproduction Workers	
N of Industries	451	393	451	393	451	393
Years	1978 to 2002	1978 to 2002	1978 to 2002	1978 to 2002	1978 to 2002	1978 to 2002
Model	1	2	3	4	5	6
Δ Computer investments	.016**	.021**	–.006	–.011	.027	.027
	(.009)	(.010)	(.015)	(.017)	(.025)	(.028)
Computer investments $_{(t-1)}$	.031**	.030**	–.026**	–.024**	–.004	–.008
	(.009)	(.010)	(.010)	(.010)	(.020)	(.021)
Δ Union density	–.019**	–.020**	.057**	.057**	.008	.006
	(.006)	(.006)	(.012)	(.013)	(.008)	(.008)
Union density $_{(t-1)}$	–.019**	–.019**	.099**	.099**	.024**	.024**
	(.007)	(.007)	(.012)	(.013)	(.008)	(.009)
Δ Unemployment	.041**	.042**	.020	.019	.044**	.042**
	(.008)	(.008)	(.012)	(.013)	(.011)	(.011)
Unemployment $_{(t-1)}$	.005	.007	–.017	–.022	.000	–.001
	(.009)	(.009)	(.022)	(.023)	(.018)	(.019)
Δ Capital concentration	–.020	–.029	–.034	–.033	–.078**	–.086**
	(.022)	(.022)	(.032)	(.034)	(.035)	(.036)
Capital concentration $_{(t-1)}$	–.003	–.002	.010	.011	–.013	–.012
	(.009)	(.010)	(.012)	(.012)	(.008)	(.009)
Δ Import penetration		–.002		.019**		.008**
		(.001)		(.006)		(.004)
Import penetration $_{(t-1)}$		.003**		–.004**		.000
		(.001)		(.001)		(.000)
Recession (dummy)	.501**	.506**	.741**	.763**	.851**	.889**
	(.065)	(.070)	(.146)	(.156)	(.103)	(.109)
Dependent variable $_{(t-1)}$	–.169**	–.165**	–.250**	–.242**	–.248**	–.238**
	(.026)	(.028)	(.019)	(.019)	(.038)	(.038)
Constant	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
R^2	.132	.135	.156	.163	.178	.179
Modified DW	1.94	1.96	2.06	2.06	1.96	1.97
N	11,269	9,819	11,269	9,819	11,269	9,819

Note: Each column represents a pooled regression of changes in labor's share. Table entries are OLS estimates. Robust standard errors in parentheses are heteroskedasticity and autocorrelation consistent. Estimates are weighted by mean industry share of total value added over the years. Δ indicates the annual change in the variable.
**$p < .05$ (two-tailed test).

Table 5. Computer and Income Distribution in Two-Digit Private Industries, Unstandardized Coefficients from Single Equation ECM; Dependent Variables Are Annual Change in Skilled Workers' Wage-Bill Share and in Skilled and Unskilled Workers' Income Share

Dependent Variable	Δ Workers' Share in Industry's Wage Bill		Δ Workers' Share in Industry's Income			
Class	College Workers		High School Workers		College Workers	
N of Industries	43	43	43	43	43	43
Years	1969 to 1997	1988 to 2007	1969 to 1997	1988 to 2007	1969 to 1997	1988 to 2007
Model	1	2	3	4	5	6
Δ Computer investments	.123**	.140**	.134	–.056	–.184	.082
	(.059)	(.071)	(.144)	(.034)	(.142)	(.053)
Computer investments $_{(t-1)}$	.073**	.160**	.005	–.050**	.023	.068**
	(.026)	(.059)	(.016)	(.014)	(.022)	(.020)
Δ Union density	–.244**	–.240	–.008	.077	–.055	–.045
	(.077)	(.179)	(.067)	(.076)	(.047)	(.079)
Union density $_{(t-1)}$	–.164**	–.282**	.088**	.134**	–.008	–.081**
	(.038)	(.075)	(.033)	(.043)	(.024)	(.027)
Δ Unemployment	.081	–.069	.078	.114	.065	–.076
	(.053)	(.120)	(.081)	(.072)	(.099)	(.079)
Unemployment $_{(t-1)}$	.126**	.052	–.004	–.092**	–.123	–.043
	(.050)	(.089)	(.080)	(.047)	(.088)	(.067)
Recession (dummy)	–.089	–.357	.419	.017	.150	.252
	(.349)	(.545)	(.257)	(.142)	(.260)	(.213)
Dependent variable $_{(t-1)}$	–.241**	–.415**	–.191**	–.299**	–.235**	–.277**
	(.041)	(.088)	(.045)	(.031)	(.068)	(.042)
Constant	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
R^2	.132	.236	.116	.207	.141	.169
Modified DW	2.15	2.04	2.23	2.28	2.02	1.98
N	1,247	860	1,247	860	1,247	860

Note: Each column represents a pooled regression of changes in labor's share. Table entries are OLS estimates. Robust standard errors in parentheses are heteroskedasticity and autocorrelation consistent. Estimates are weighted by mean industry share of total value added over the years. Δ indicates the annual change in the variable.
**$p < .05$ (two-tailed test).

for computerization as well, which is the main counterargument for the decline in labor's share. The empirical results strongly support the power relations thesis and reveal that the decline in unionization, rise in unemployment, and importation of goods from less-developed countries all curbed workers' bargaining power over the past decades and led to a significant decline in labor's share. In particular, waning unionization, which led to the erosion of rank-and-file workers' bargaining power, was the main force behind the decline in labor's share.

Third, given all the evidence presented here, the class-biased technological change hypothesis appears to be a fruitful contribution for explaining inequality dynamics over the past 30 years. Whereas most work in economics focuses on mechanisms that link technology use to workers and physical capital productivity and hence to their relative income shares, I argue for additional mechanisms that link technology use to classes' positional power in the labor process and hence to their relative income shares. Specifically, I contend that computer-based technologies embody essential characteristics that favor capitalists (and high-skilled workers), while eroding most rank-and-file workers' organizational power. Consequently, computerization has reduced labor's share *indirectly* through its role in reducing unionization. Results from the empirical analysis confirm the CBTC thesis and demonstrate that computerization had little effect on labor's share in industries where organized labor never had much of a presence.

Computerization may have exacerbated union decline as a result of several mechanisms. Among them, I emphasized the one documented by Milkman (1995) for auto workers. Milkman shows that automation of the production process downsized many unionized manufacturing jobs by utilizing computer equipment for tasks previously performed manually by blue-collar, mostly unionized workers. I also identified two other plausible mechanisms through which computerization degrades labor unions that have not received much attention in the labor movement literature and thus require further investigation. First, the computer revolution's strengthening of management control may have empowered employers and management, allowing them to use more legal and illegal anti-union tactics designed to intensely monitor and punish union activity. Second, computer technology is linked to skill polarization in the workforce, which may have undermined workers' solidarity, thereby reducing the likelihood of working-class cohesion and collective action.

The arguments and findings of this study also contribute to the debate over the causes of rising earnings inequality in the past 30 years, indicating that worker disempowerment is behind both the decline in labor's share and the rise in earnings inequality. The rise in earnings inequality in the United States and other countries is usually attributed to two sets of factors: most researchers view skill-biased technological change—the computerization of many workplaces that favors high-skilled workers—as the main cause of rising wage inequality in the United States and relegate institutional factors, such as declining unionization, to a secondary role. In a recent study, Western and Rosenfeld (2011) present evidence that counters this widely held view. They show that organized labor's decline and the growing stratification of wages by education, which are indicative of the expected outcome of computerization according to the SBTC, have the same explanatory power for rising earnings inequality.

The evidence presented here gives an even clearer-cut answer to the inequality debate. By incorporating direct measures for computer technologies and unionization at the industry level, this study reveals that organized labor's decline is the main factor that led to the decline in labor's share. Moreover, computerization contributed to the decline in labor's share partly through its negative impact on unionization, supporting a class-biased technological change argument. For that reason, this study strongly advocates using industrial data, which make it possible to directly measure computerization and unionization, and testing the CBTC thesis in the context of rising earnings inequality.

More generally, the analysis casts light on a defining feature of the current state of inequality—capitalists have grabbed the lion's share of income growth over the past three decades. From 1948 to 1973, the hourly compensation of a typical U.S. worker grew in tandem with productivity, indicating a relatively equal social distribution of the fruits of economic growth and productivity gains. The state of inequality dramatically shifted in the past three decades. Although productivity grew 80.4 percent between 1973 and 2011, expanding total income, average hourly compensation, which includes the pay of CEOs, increased by only 39.2 percent and—even more strikingly—the median worker's hourly compensation grew by just 10.7 percent (Mishel et al. 2012). So where did the income growth go? As this study shows, income growth occurred mainly in income that accrues to owning capital—profits, interest, dividends, and rent. As a result, workers have experienced a large and persistent reduction in their share of national income.

Capitalists, however, are not the only social stratum that grabbed a handful of income. Some workers did, too, in particular the "working rich." Using individual tax returns data, Piketty and Saez (2003) document a dramatic growth in the top shares of income and wages since the 1980s. They also show that the dramatic growth in top income shares was primarily due to a surge in wages at the very top of the wage distribution, with little growth of capital incomes held by these rich individuals. This may suggest that these new high-income earners, mainly CEOs and workers employed in the finance sector, have not yet had time to accumulate substantial fortunes that yield capital income and therefore have gained only slightly from the surge in capital income. Hence, although most research on rising inequality focuses on rising earnings inequality among workers and the rise in the top shares of income, "that may be yesterday's story" (Krugman 2012). The evidence presented here suggests it is clearly capitalists who have rarely had it so good.

DATA APPENDIX

Computerization in Two-Digit Industry Data

I used data on investments in fixed assets from the Bureau of Economic Analysis (BEA) Industry Economic Accounts to measure computer technology at the two-digit industry level between 1969 and 2007. *Computer technology* in the BEA data is measured by real investments in computers as a share of total investments (in millions of 2008 dollars). Under *computers,* I included investments in mainframe computers, personal computers, direct access storage devices, computer terminals, computer storage devices, integrated systems, and software.

Computerization and Capital Concentration in Four-Digit Manufacturing Industry Data

I relied on data collected by the U.S. Census Bureau on four-digit manufacturing industries to examine possible explanations for changes in labor's share within U.S. manufacturing. My main data sources were the Census Bureau's Annual Survey of Manufactures (ASM) and Census of Manufactures (CM). The ASM is a sample of about 60,000 manufacturing establishments, carried out by the Census Bureau. The sample is drawn from the CM, which is performed every five years and designed to collect data on all manufacturing establishments in the country. The ASM collects data on total employment, total payroll, value added, production worker wages, and expenditures on new capital investment. The information is reported for four-digit manufacturing industries.

In a joint effort by the National Bureau of Economic Research (NBER) and the U.S. Census Bureau's Center for Economic Studies (CES), many of the ASM variables were combined into one dataset covering the period

1958 to 2005. I used the NBER dataset and added several relevant variables that are not part of the NBER database, based on hard copies of the ASM and CM. Overall, my database contains annual information on 451 four-digit manufacturing industries for the period 1978 through 2002. The industries are those defined in the 1987 SIC, and they cover the entire manufacturing sector.

An indicator for *computer technology* in the specified manufacturing industries is similar to the one I used for the entire private sector. The ASM asked about computer investments ("new capital expenditures on computers and peripheral data processing equipment") in economic census years (1977, 1982, 1987, and 1992). This question was not asked in 1997 but was asked again in 2002. I imputed missing data using linear interpolation. The U.S. Bureau of the Census, as part of the periodic CM, also compiles aggregate concentration figures for this sector. These data are based solely on the domestic operations of firms in the manufacturing sector. *Concentration* is scored between zero and one, calculated by the CM as the ratio of sales by the four largest firms to the total volume of sales in each industry. These data are available for the economic census years (plus a few additional years) beginning in 1947 and continuing through the most recently available census in 2007.

Unionization

I collected data from the CPS for unionization at the three-digit industry level. The first time a union status question was asked of private and public sector workers was in the March 1971 survey. The CPS began collecting individual union membership information on a regular basis in May 1973. From 1973 to 1980, the May CPS administered union questions to the full monthly samples (all rotation groups); only a quarter of the sample was asked union status questions in May 1981. There were no union questions in the 1982 CPS. Beginning in January 1983, the CPS began asking union membership and coverage questions each month to a quarter of the sample (the outgoing rotation groups). *Union membership* is measured in the standard way by the ratio of number of union members to the total industry workforce. Union membership figures have been compiled for all employed civilian wage and salary workers, age 16 years and over. Not included are employed 14- to 15-year-olds, self-employed workers, and a small number of unpaid family workers.

All information on union membership presented so far was taken from the CPS. However, these surveys did not collect information on union membership back to the late 1950s; to extend the series back to those years, we must rely on data reported by labor unions every two years to the federal government and published by the Bureau of Labor Statistics (BLS) in the *Directory of National Unions and Employee Associations*. Because this is a biennial survey, data at the industry level are available only for every second year, and values for intervening years must be interpolated. These reports include information on union membership by industry for only 17 (1958 to 1964) and 28 (1968 to 1978) nonagricultural private industries. I therefore imputed the aggregate information to the more detailed industries, assuming the disaggregate industries were relatively similar in terms of union density. The resulting series for unionization are likely quite accurate for the 1970s but substantially less so for the preceding years. The Directory series also has a number of drawbacks as reliable information on union membership by industrial sector. Most important, unions are thought to inflate their membership figures to present a slightly exaggerated impression of their size. Unemployed and retired members who have stopped paying their union dues are often kept on the books. I adjusted the membership data published every two years in the Directory by an estimate of the ratio of union membership in the CPS to union membership reported in the Directory. The ratios I used to adjust the Directory membership figures were a simple average of the numbers for 1970, 1972, 1974, 1976, and 1978.

Table A1. Tests for Cointegration in the Time-Series Cross-Sectional Data

Years	Industries	Labor's Share	Computer Investments	Union Density	Unemployment	Capital Concentration	Import Penetration
p value from Levin-Lin-Chu test for unit-root in first-differences[a]							
1969–97	Private industries	.000**	.001**	.000**	.000**		
1988–07	Private industries	.000**	.000**	.000**	.000**		
1978–02	Manufacturing industries	.000**	.000**	.000**	.000**	.000**	.000**
p value from Im-Pesaran-Shin test for unit-root in first-differences[b]							
1969–97	Private industries	.000**	.000**	.000**	.000**		
1988–07	Private industries	.000**	.000**	.000**	.000**		
1978–02	Manufacturing industries	.000**	.000**	.000**	.000**		
p value from Levin-Lin-Chu test for unit-root in the residual[c]							
1969–97	Private industries		.014**	.000**	.002**		
1988–07	Private industries		.002**	.002**	.001**		
1978–02	Manufacturing industries		.000**	.000**	.000**	.000**	.000**
p value from Im-Pesaran-Shin test for unit-root in the residual[d]							
1969–97	Private industries		.003**	.000**	.000**		
1988–07	Private industries		.362	.254	.031**		
1978–02	Manufacturing industries		.000**	.000**	.000**	.000**	.000**
t-bar from Im-Pesaran-Shin test for unit-root in the residual[e]							
1969–97	Private industries		–1.942**	–2.189**	–2.059**		
1988–07	Private industries		–1.535	–1.572	–1.769**		
1978–02	Manufacturing industries		–2.144**	–2.500**	–2.365**	–2.161**	–2.107**

Note: The Levin-Lin-Chu (2002) test assumes that all panels have the same autoregressive parameter. The Im-Pesaran-Shin (2003) test relaxes the assumption and allows each panel to have its own autoregressive parameter. The alternative hypothesis in the Im-Pesaran-Shin test is that the fraction of panels that are stationary is nonzero.

[a]The null hypothesis is that panels contain unit roots in the first-difference form.

[b]The null hypothesis is that all panels contain unit roots in the first-difference form.

[c]The residual from a simple bivariate regression of Y on X. The null hypothesis is that panels contain unit roots in the residual.

[d]The residual from a simple bivariate regression of Y on X. The null hypothesis is that all panels contain unit roots in the residual.

[e]*t*-bar is the mean of industry-specific Dickey-Fuller tests.

**$p < .05$ (two-tailed test).

Import Penetration

I used import data by industry and country from Schott (2010) to construct a measure of the share of imports in each industry originating in low-wage countries (*import penetration*). I classified a country as low-wage in year *t* if its per capita GDP was less than 20 percent of U.S. per capita GDP (data on countries' per capita GDP are from the Penn World Table). This cutoff captures an average of 80 countries per year. The list of countries classified as low wage includes China and India as well as relatively small exporters such as Angola. I chose a 20 percent cutoff to classify countries as low wage because it represents the world's most labor-abundant cohort of countries and therefore the set of countries most likely to have an effect on U.S. manufacturing plants. Using import data by industry and country from Schott (2010), I computed import penetration for 393 of 459 four-digit 1987 SIC manufacturing industries between 1978 and 2002. These 393 industries encompass 87 percent of manufacturing employment and 93 percent of manufacturing value.

Funding

This research was supported by The Israel Science Foundation (ISF).

Acknowledgments

I started this project in 2010 when I was Elfenworks postdoctoral scholar at the Stanford Center for the Study of Poverty and Inequality, where I benefited from the opportunity to present earlier versions of this article at the Center's conferences and seminars. I am especially grateful to David Grusky for insightful discussions and valuable comments. I also thank Yinon Cohen, the *ASR* editors, and anonymous reviewers for their comments on earlier drafts. Earlier versions of this article were presented at the spring meeting of the ISA Research Committee on Social Stratification and Mobility (2010) and the 106th Annual Meeting of the American Sociological Association (2011).

Notes

1. The main reason for including capital depreciation is that statistics of gross income are much more reliable than those of net income; the latter are based on net incomes of firms whose allowance for depreciation is more or less arbitrary.
2. Realized capital gains, which became key components of top executive remuneration in the 1990s (Piketty and Saez 2003), are generally not counted in national income accounts and therefore are not part of either labor's compensation or capitalists' profits.
3. I treat financialization as an integral part of overall capital income and consider its growing share relative to labor income to be determined by the erosion in workers' positional power. This is in some way different from the approach taken by Lin and Tomaskovic-Devey (forthcoming), who examine financialization as an independent variable that affects income inequality.
4. A measure of labor's share that includes only employees' compensation on the labor side (thereby treating income of the self-employed entirely as capital income) is biased over time because it does not take into account the move from self-employment to wage and salary employment (Johnson 1954; Kravis 1959). To avoid this bias, the numerator of labor's share here is labor income of employees and self-employed.
5. The notoriously high salaries on Wall Street may have pulled labor's share in FIRE upward over the 1990s. Even so, the finance sector has the lowest levels of labor's share, mainly due to the highly profitable economic activity in real estate and banking.
6. Common examples of new computer technology in manufacturing include computerized industrial robots, automated inventory and parts storage, and computers for monitoring, analyzing, and controlling industrial processes. Prominent applications of computer technology in services include common desktop software, data entry and transactions processing systems, automated teller machines, and inventory management devices and software.
7. A more critical view holds that in many workplaces new technology is meant to replace workers, not transform work in a way that increases productivity (Noble 1978).
8. Two examples given by Skott (2010) clearly illustrate how computer technology marks a shift in the relationship between owners and workers. First, a new "black box" installed in trucks gives a truck's owner the ability to monitor driver performance by providing full information on the vehicle for every second. In retail, computer technology provides a way of ensuring that the money collected from customers matches the money a clerk hands over to the employer, thereby affecting workers' and employers' relative power.
9. The CPS series are available only at the three-digit level, which made me assume that the three-digit unionization and unemployment information is relevant to the distribution process at the four-digit level in manufacturing industries. To be sure,

matching three-digit level data to four-digit manufacturing data creates a measurement error and decreases the likelihood of finding a significant impact of unionism and unemployment.

10. ECMs are more familiar as the general Auto-regressive Distributed Lag Model (ADL), also called a Partial-Adjustment Differential Equation Model (PADEM).
11. Results from unit root tests for panel data show that in all models we can reject the null hypothesis that panels contain unit roots in the residual.
12. Stationary tests confirm that the variables are non-stationary. Yet these variables are bounded between 0 and 100 percent and therefore do not perform like integrated variables, which tend to wander far from their means so the variance of the observations grows larger and larger over time.
13. To deal with the potential endogeneity of computer technology (i.e., the ICT revolution was a response to the profit squeeze in the 1960s), I estimated models with a three-year lagged value for computer technology. Results were substantially the same as those for one-year lagged value.
14. That the net effect of computerization raised labor's share in manufacturing in the short-run might be due to a short-term rise in skilled workers' wages, which was offset in the long-run by a larger rise in capitalists' profits.

References

Acemoglu, Daron. 1998. "Why Do New Technologies Complement Skills? Directed Technical Change and Wage Inequality." *Quarterly Journal of Economics* 113:1055–1089.

Acemoglu, Daron. 2002. "Directed Technical Change." *Review of Economic Studies* 69:781–809.

Acemoglu, Daron. 2003. "Labor- and Capital-Augmenting Technical Change." *Journal of European Economic Association* 1:1–37.

Alderson, Arthur S. and Francois Nielsen. 2002. "Globalization and the Great U-Turn: Income Inequality Trends in 16 OECD Countries." *American Journal of Sociology* 107:1244–99.

Autor, David, Lawrence F. Katz, and Alan Krueger. 1998. "Computing Inequality: Have Computers Changed the Labor Market?" *Quarterly Journal of Economics* 113:1169–1214.

Beck, Nathaniel and Jonathan N. Katz. 2011. "Modeling Dynamics in Time-Series–Cross-Section Political Economy Data." *Annual Review of Political Science* 14:331–52.

Bentolila, Samuel and Gilles Saint-Paul. 2003. "Explaining Movements in the Labor Share." *Contributions to Macroeconomics* 3:Article 9.

Berman, Eli, John Bound, and Zvi Griliches. 1994. "Changes in the Demand for Skilled Labor within U.S. Manufacturing: Evidence from the Annual Survey of Manufactures." *Quarterly Journal of Economics* 109:367–97.

Bernard, Andrew B., Bradford J. Jensen, and Peter K. Schott. 2006. "Survival of the Best Fit: Exposure to Low-Wage Countries and the (Uneven) Growth of U.S. Manufacturing Plants." *Journal of International Economics* 68:219–37.

Blanchard, Olivier J. 1997. "The Medium Run." *Brookings Papers on Economic Activity* 2:89–141.

Bronfenbrenner, Kate. 2009. "No Holds Barred: The Intensification of Employer Opposition to Organizing." *Economic Policy Institute,* Briefing Paper No. 235.

Burawoy, Michael. 1985. *The Politics of Production*. London: Verso.

Bureau of Economic Analysis (BEA). N.d. *Industry Economic Accounts*. Retrieved September 22, 2009 (http://www.bea.gov/industry/index.htm).

Bureau of Economic Analysis (BEA). N.d. *National Income and Product Accounts Tables*. Retrieved September 22, 2009 (http://www.bea.gov/national/).

Burris, Beverly H. 1993. *Technocracy at Work*. Albany: State University of New York Press.

Burris, Beverly H. 1998. "Computerization of the Workplace." *Annual Review of Sociology* 24:141–57.

Crowley, Martha, Daniel Tope, Lindsey Joyce Chamberlain, and Randy Hodson. 2010. "Neo-Taylorism at Work: Occupational Change in the Post-Fordist Era." *Social Problems* 57:421–47.

De Boef, Suzanna and Luke Keele. 2008. "Taking Time Seriously." *American Journal of Political Science* 52:184–200.

Dew-Becker, Ian and Robert J. Gordon. 2005. "Where Did the Productivity Growth Go? Inflation Dynamics and the Distribution of Income." *Brookings Papers on Economic Activity* 2:67–127.

DiMaggio, Paul and Bart Bonikowski. 2008. "Make Money Surfing the Web? The Impact of Internet Use on the Earnings of U.S. Workers." *American Sociological Review* 73:227–50.

Engle, Robert F. and Clive W. J. Granger. 1987. "Co-integration and Error Correction: Representation, Estimation, and Testing." *Econometrica* 55:251–76.

Epstein, Gerald A. and Arjun Jayadev. 2005. "The Rise of Rentier Incomes in OECD Countries: Financialization, Central Bank Policy and Labor Solidarity." Pp. 46–74 in *Financialization and the World Economy,* edited by G. A. Epstein. Northampton, MA: Edward Elgar.

Esping-Andersen, Gøsta. 1985. *Politics against Markets*. Princeton, NJ: Princeton University Press.

Farber, Henry S. and Bruce Western. 2001. "Accounting for the Decline of Unions in the Private Sector, 1973–1998." *Journal of Labor Research* 22:459–85.

Gollin, Douglas. 2002. "Getting Income Shares Right." *Journal of Political Economy* 110:458–74.

Grusky, David B. and Jesper B. Sørensen. 1998. "Can Class Analysis Be Salvaged?" *American Journal of Sociology* 103:1187–1234.

Halaby, Charles N. 2004. "Panel Models in Sociological Research: Theory into Practice." *Annual Review of Sociology* 30:507–544.

Henley, Andrew G. 1987. "Trades Unions, Market Concentration, and Income Distribution in United States Manufacturing Industry." *International Journal of Industrial Organization* 5:193–210.

Hicks, Alexander. 1999. *Social Democracy and Welfare Capitalism: A Century of Income Security Politics*. Ithaca, NY: Cornell University Press.

Im, Kyung S., Hashem M. Pesaran, and Yongcheol Shin. 2003. "Testing for Unit Roots in Heterogeneous Panels." *Journal of Econometrics* 115:53–74.

Jacobs, David. 1988. "Corporate Economic Power and the State: A Longitudinal Assessment of Two Explanations." *American Journal of Sociology* 93:852–81.

Jacobs, David and Marc Dixon. 2006. "The Politics of Labor-Management Relations: Detecting the Conditions That Affect Changes in Right-to-Work Laws." *Social Problems* 53:118–37.

Johnson, D. Gale. 1954. "The Functional Distribution of Income in the United States, 1850–1952." *Review of Economics and Statistics* 35:175–82.

Kalecki, Michal. 1938. "The Determinants of Distribution of the National Income." *Econometrica* 6:97–112.

Kalleberg, Arne L. and Mark E. Van Buren. 1996. "Is Bigger Better? Explaining the Relationship between Organization Size and Job Rewards." *American Sociological Review* 61:47–66.

Kalleberg, Arne L., Michael Wallace, and Lawrence E. Raffalovich. 1984. "Accounting for Labor's Share: Class and Income Distribution in the Printing Industry." *Industrial and Labor Relations Review* 37:386–402.

Keynes, John M. 1939. "Relative Movements of Real Wages and Output." *Economic Journal* 49:34–51.

Korpi, Walter. 1983. *The Democratic Class Struggle*. London: Routledge and Kegan Paul.

Korpi, Walter. 2002. "The Great Trough in Unemployment: A Long-Term View of Unemployment, Inflation, Strikes, and the Profit/Wage Ratio." *Politics and Society* 30:365–426.

Kravis, Irving. 1959. "Relative Income Shares in Fact and Theory." *American Economic Review* 49:917–49.

Krippner, R. Greta. 2005. "The Financialization of the American Economy." *Socio-Economic Review* 3:173–208.

Kristal, Tali. 2010. "Good Times, Bad Times: Postwar Labor's Share of National Income in Capitalist Democracies." *American Sociological Review* 75:729–63.

Kristal, Tali. 2013. "Slicing the Pie: State Policy, Class Organization, Class Integration, and Labor's Share of Israeli National Income." *Social Problems* 60:100–127.

Kristal, Tali and Yinon Cohen. 2007. "Decentralization of Collective Wage Agreements and Rising Wage Inequality in Israel." *Industrial Relations* 46:613–35.

Kristal, Tali and Yinon Cohen. 2012. *The Causes of Rising Inequality: What do Computerization and Fading Pay-Setting Institutions Do?* Unpublished manuscript. Department of Sociology, University of Haifa.

Krueger, Alan. 1993. "How Computers Have Changed the Wage Structure: Evidence from Microdata, 1984–1989." *Quarterly Journal of Economics* 108:33–60.

Krueger, Alan. 1999. "Measuring Labor's Share." *American Economic Review* 89:45–51.

Krugman, Paul. 2012. "Robots and Robber Barons." *New York Times,* December 9th.

Levin, Andrew, Chien-Fu Lin, and Chia-Shang James Chu. 2002. "Unit Root Tests in Panel Data: Asymptotic and Finite-Sample Properties." *Journal of Econometrics* 108:1–24.

Lin, Ken-Hou and Donald Tomaskovic-Devey. Forthcoming. "Financialization and U.S. Income Inequality, 1970–2008." *American Journal of Sociology*.

Macpherson, David A. 1990. "Trade Unions and Labor's Share in U.S. Manufacturing Industries." *International Journal of Industrial Organization* 8:143–51.

Milkman, Ruth. 1995. *Farewell to the Factory: Auto Workers in the Late Twentieth Century*. Berkeley: University of California Press.

Mishel, Lawrence, Josh Bivens, Elise Gould, and Heidi Shierholz. 2012. *The State of Working America,* 12th ed. Ithaca, NY: Economic Policy Institute and ILR Press.

Moller, Stephanie, Arthur S. Alderson, and Francois Nielsen. 2009. "Changing Patterns of Income Inequality in U.S. Counties, 1970–2000." *American Journal of Sociology* 114:1037–1101.

Moller, Stephanie, Evelyne Huber, John D. Stephens, David Bradley, and Francois Nielsen. 2003. "Determinants of Relative Poverty in Advanced Capitalist Democracies." *American Sociological Review* 68:22–51.

Noble, David F. 1978. "Social Choice in Machine Design: The Case of Automatically Controlled Machine Tools, and a Challenge for Labor." *Politics and Society* 8:313–47.

Piketty, Thomas and Emmanuel Saez. 2003. "Income Inequality in the United States, 1913–1998." *Quarterly Journal of Economics* 118:1–39.

Raffalovich, Lawrence E., Kevin T. Leicht, and Michael Wallace. 1992. "Macroeconomic Structure and Labor's Share of Income: United States, 1950 to 1980." *American Sociological Review* 57:243–58.

Rubin, Beth A. 1986. "Trade Union Organization, Labor Militancy, and Labor's Share of National Income in the United States, 1949–1978." *Research in Social Stratification and Mobility* 5:223–42.

Sakamoto, Arthur and Changhwan Kim. 2010. "Is Rising Earnings Inequality Associated With Increased Exploitation? Evidence for U.S. Manufacturing Industries, 1971–1996." *Sociological Perspectives* 53:19–43.

Schott, Peter K. 2010. *U.S. Manufacturing Exports and Imports Data by SIC or NAICS Category and Partner Country, 1972 to 2005*. Retrieved May 12, 2010 (http://faculty.som.yale.edu/peterschott/sub_international.htm).

Skott, Peter. 2010. "Power Biased Technical Change, Endogenous Mismatch and Institutional Change." *New School Economic Review* 4:50–64.

Solow, Robert M. 1958. "A Skeptical Note on the Constancy of Relative Shares." *American Economic Review* 48:618–31.

Southworth, Caleb and Judith Stepan-Norris. 2009. "American Trade Unions and Data Limitations: A New Agenda for Labor Studies." *Annual Review of Sociology* 35:297–320.

Stearns, Linda B. and Kenneth D. Allan. 1996. "Economic Behavior in Institutional Environments: The Corporate Merger Wave of the 1980s." *American Sociological Review* 61:699–718.

Stepan-Norris, Judith and Maurice Zeitlin. 2003. *Left Out: Reds and America's Industrial Unions*. New York: Cambridge University Press.

Stephens, John D. 1979. *The Transition from Capitalism to Socialism*. London: Macmillan.

Tomaskovic-Devey, Donald and Ken-Hou Lin. 2011. "Income Dynamics, Economic Rents, and the Financialization of the U.S. Economy." *American Sociological Review* 76:538–59.

Tope, Daniel and David Jacobs. 2009. "The Politics of Union Decline: The Contingent Determinants of Union Recognition Elections and Victories." *American Sociological Review* 74:842–64.

Vallas, Steven P. 1993. *Power in the Workplace*. Albany: State University of New York Press.

Vallas, Steven P. and John P. Beck. 1996. "The Transformation of Work Revisited: The Limits of Flexibility in American Manufacturing." *Social Problems* 43:339–61.

Volscho, Thomas W. and Nathan J. Kelly. 2012. "The Rise of the Super-Rich: Power Resources, Taxes, Financial Markets, and the Dynamics of the Top 1 Percent, 1949 to 2008." *American Sociological Review* 77:679–99.

Voss, Kim and Rachel Sherman. 2000. "Breaking the Iron Law of Oligarchy: Union Revitalization in the American Labor Movement." *American Journal of Sociology* 106:303–349.

Wallace, Michael and David Brady. 2001. "The Next Long Swing: Spatialization, Technocratic Control, and the Restructuring of Work at the Turn of the Century." Pp. 101–133 in *Sourcebook of Labor Markets: Evolving Structures and Processes,* edited by I. Berg and A. Kalleberg. New York: Plenum Press.

Wallace, Michael, Kevin T. Leicht, and Lawrence E. Raffalovich. 1999. "Unions, Strikes, and Labor's Share of Income: A Quarterly Analysis of the United States, 1949–1992." *Social Science Research* 28:265–88.

Wallace, Michael, Beth A. Rubin, and Brian T. Smith. 1988. "American Labor Law: Its Impact on Working Class Militancy, 1901–1980." *Social Science History* 12:1–29.

Weeden, Kim A. 2002. "Why Do Some Occupations Pay More than Others? Social Closure and Earnings Inequality in the United States." *American Journal of Sociology* 108:55–101.

Western, Bruce and Jake Rosenfeld. 2011. "Unions, Norms, and the Rise in U.S. Wage Inequality." *American Sociological Review* 76:513–37.

White, Lawrence J. 2002. "Trends in Aggregate Concentration in the United States." *Journal of Economic Perspectives* 16:137–60.

Wood, Adrian. 1994. *North–South Trade, Employment and Inequality*. Oxford, UK: Oxford University Press.

Wright, Erik Olin. 1979. *Class Structure and Income Determination*. New York: Academic Press.

Wright, Erik Olin and Luca Perrone. 1977. "Marxist Class Categories and Income Inequality." *American Sociological Review* 42:32–55.

Zuboff, Shoshana. 1988. *In the Age of the Smart Machine*. New York: Basic Books.

Tali Kristal is an Assistant Professor of Sociology at University of Haifa. Her research examines pay-setting institutions, politics, and trends in income inequality in Israel, the United States, and other rich countries. Her current work investigates the impact of changes in pay-setting institutions and computerization on rising earnings and compensation inequality in the United States.