CHANGES IN THE AGE AND EDUCATION PROFILE OF DISPLACED WORKERS

DANIEL RODRIGUEZ and MADELINE ZAVODNY*

This analysis of data from the Displaced Workers Surveys suggests that between the periods 1983–87 and 1993–97, although the likelihood of involuntary job loss declined among most age groups, including older workers, it rose for middle-aged and older workers *relative to* younger workers. Three potential explanations for this shift the authors investigate are changes in educational attainment, changes in the relationship between education and displacement, and industry shifts that had adverse effects on older workers relative to younger workers. The results of the analysis indicate that the relative displacement rate among college graduates increased over time, but there were few significant changes in the relationship between displacement and education within or across age groups. The probability of displacement increased significantly for workers in service-related industries across all age groups. The results do not conclusively indicate why older workers' relative risk of displacement increased but do rule out several possibilities.

In recent years, the media has devoted considerable attention to the effects of downsizing and corporate restructuring on workers, focusing particular attention on the plight of middle-aged, white-collar workers. For example, a cover story in *Fortune* noted that employers appear to be laying off older workers who were previously protected by their seniority and asked whether workers are now "finished at forty" (Munk 1999). Similarly, the media characterized the downturn in the early 1990s as much tougher than previous recessions on older workers and on white-collar workers, particularly mid-level managers (Labich 1993). Such anecdotal evidence suggests that the incidence of displacement may have increased over time among middle-aged and more educated workers.

Previous research indicates that older workers are generally less likely to be displaced than are younger workers. Data from 1968 to 1992 indicate that the likelihood of involuntary job loss is generally lower among men aged 35 and older than

*Daniel Rodriguez is Assistant Professor of Organization and Management at Goizueta Business School, Emory University, and Madeline Zavodny is Associate Professor of Economics at Occidental College. This paper was begun while the second author was Senior Economist and Policy Advisor at the Federal Reserve Bank of Atlanta. The authors thank Gerald Oettinger for helpful comments and Smit Sharma and Weiyi Shi for research assistance.

The data and programs used to generate the results presented in this paper are available from Madeline Zavodny at Department of Economics, Occidental College, 1600 Campus Rd., Los Angeles, CA 90041.

Industrial and Labor Relations Review, Vol. 56, No. 3 (April 2003).
0019-7939/00/5603 $01.00

among men aged 25–34 with the same educational attainment (Boisjoly, Duncan, and Smeeding 1998). The probability of displacement declines monotonically with age when data on both sexes are used (Farber 1993; Farber 1997).

The evidence on whether the probability of job loss has risen over time for older workers is mixed. Farber (1993) found that the probability of job loss for workers aged 40–60 was higher in 1990–91 than in 1982–83, relative to otherwise equivalent workers aged 20–24. Siegel, Muller, and Honig (2000) reported that the incidence of job loss among men aged 45–59 was higher during the 1990–91 recession than during the 1981–82 recession, particularly among blue-collar workers. Polsky (1999) found that the probability of job separation, which encompasses quits and firings as well as involuntary job loss, did not increase significantly between the periods 1976–81 and 1986–91 for male household heads aged 35–54 relative to those aged 25–34. Polsky also reported a sizable, but statistically insignificant, increase in the probability of job loss, conditional on job separation, for men aged 45–54 relative to men aged 25–34. Gottschalk and Moffitt (1999) found that the proportion of exits that were involuntary increased significantly with age over the 1980s and 1990s but that the probability of involuntary termination did not change over time.

Education has traditionally shielded workers from displacement, as has working in a white-collar or service-producing job. Rates of involuntary job loss are dramatically higher for less educated workers than for more educated workers, with workers who did not finish high school more than twice as likely as college graduates to be displaced (Farber 1997). Job loss rates are higher for craftsmen, operatives, and laborers than for other workers, and higher for goods-producing workers than for workers in service-related industries (Farber 1997). However, these gaps may have narrowed over time. Aaronson and Sullivan (1998) reported that long-standing gaps in displacement rates by education, occupation, and industry declined or disappeared during the 1990s. Controlling for other characteristics, however, Polsky (1999) did not find a significant change in men's likelihood of displacement across education or industry groups between 1976–81 and 1986–91.

This study examines changes in the likelihood of involuntary job loss across demographic groups over the past two decades. Data from the Displaced Workers Surveys on individuals aged 25–64 indicate that the probability of displacement among workers aged 35 and older rose relative to that among younger workers between 1983–87 and 1993–97. The relative increase was most pronounced among workers aged 45–54. Although some previous studies have noted that displacement appears to have increasingly affected older workers, the causes of this shift have not been investigated. This study extends the current literature by examining the contribution of changes in educational attainment, industry, and several other factors to the observed relative increase in displacement of older workers.

Theoretical Framework

Differences in specific human capital are a primary reason displacement rates vary across age and education groups. Firms and workers typically share the cost of and return to investment in firm- or job-specific human capital. The cost of this investment is usually incurred early during a worker's tenure and the returns are earned later, resulting in upward-sloping wage-tenure profiles (Becker 1975). A firm cannot recoup its investment in a worker's specific human capital if that worker is laid off, so the greater a worker's specific human capital, all else equal, the less likely it is that the firm will lay off the worker (Topel 1991). Since older workers tend to have more specific human capital than do younger workers, employers are less likely to lay off the former. This negative relationship between the likelihood of displacement and age has been widely noted in the literature (Boisjoly, Duncan, and Smeeding 1998; Fairlie and Kletzer 1998; Farber 1997). A

similar argument applies to educational attainment: workers with more education are likely to have lower costs of or greater benefits from acquiring specific skills than do less educated workers (for example, Marcotte 2000).

There are several reasons why the age-displacement relationship may have changed over time. Increased demand for skilled workers may have led to changes in the age-displacement relationship if the distribution of skill differs across age groups. In addition, the increased usage of computers and other forms of technology that has contributed to the higher demand for skilled workers may have changed the incidence of displacement across age groups. Changes in the industry mix across age groups also may have led to an increase in the likelihood of displacement for older workers relative to younger workers. Such changes also may have affected the relationship between displacement and education.

Changes in the demand for skill may have shifted the age-displacement relationship adversely for older workers. Evidence suggesting that the demand for skilled workers has increased in the United States since the 1970s includes a rise in the returns to education and experience and a rise in wage differentials within education and experience groups (for example, Levy and Murnane 1992; Gottschalk 1997). Although older workers tend to have more years of experience than do younger workers, they also tend to have completed fewer years of education. An increase in the relative demand for skilled workers that led to an increase in displacement of less skilled workers relative to their more skilled counterparts could therefore have had a larger impact among older workers because of their lower average educational attainment.

Increased use of computers and other forms of technology is believed to be a primary contributor to the increase in the demand for skilled workers (Autor, Katz, and Krueger 1998). Technological change may have led to higher displacement rates among older workers if adoption of new technologies has rendered previously acquired specific human capital obsolete. As computer use has increased and other new technologies have been introduced into the workplace, the specific human capital that has traditionally shielded older, more experienced workers from displacement may have become less valuable to employers. In addition, technological change may have created the need to retrain employees in new technologies. Older workers may be more expensive to retrain than younger workers because firms have more time to recoup the costs of retraining younger workers than older workers, possibly causing the relative likelihood of displacement to increase for older workers. However, Aaronson and Housinger (1999) found that the relationship between technology usage at the industry level and the probability of displacement is weaker among older workers than among younger workers.

Differences in the industrial and educational distribution of workers may also underlie changes in the incidence of displacement across age groups. Although displacement rates have increased over time for service-producing workers, displacement still disproportionately affects goods-producing workers (Kletzer 1998). The likelihood of displacement may have risen over time for older workers relative to younger workers in part because older workers may have become more concentrated than younger workers in industries with higher displacement rates. Because more educated workers traditionally have lower displacement rates than less educated workers, changes in average educational attainment across age groups also may affect the relative incidence of displacement among older workers over time.

Greater demand for skilled workers and increased use of technology suggest that displacement should have risen among less educated workers and declined among more educated workers over time. However, if skills become obsolete more quickly because the pace of technological change has increased, as suggested by Bishop (1998), then the protection from job loss traditionally afforded by general and specific skills may have diminished over time.

Such an increase in the rate of depreciation of human capital could lead to more displacement of older and more educated workers relative to younger and less educated workers.

We use data from the Displaced Workers Surveys to measure changes in displacement rates across age, education, and other demographic groups. We also examine the extent to which changes in educational attainment and in the industrial composition of employment, as well as changes in the relationship between these factors and displacement, can explain observed changes in the incidence of displacement across age groups.

Data

The Displaced Workers Survey (DWS) supplements to the Current Population Survey (CPS) are the largest nationally representative source of data on displaced workers in the United States. The survey, which has been conducted every other year since 1984, asks individuals whether they lost a job because their plant or employer shut down or moved, their job was abolished, work was slack, a seasonal job ended, self-employment failed, or for other similar reasons. In this study, we focus on only the first three reasons for displacement (plant closure, job abolished, and slack work), because they correspond most closely to involuntary job loss.[1]

This analysis uses data from the 1986, 1988, 1996, and 1998 DWSs and examines whether individuals reported being displaced during the three years prior to the survey. During this period, the displacement interval covered by the surveys changed. Through 1992, the DWS asked whether individuals were displaced during the previous five years, whereas the more recent DWSs asked about displacement during the previous three years; the 1998 survey, for example, identifies workers displaced over 1995-97. In the earlier DWSs, workers who were displaced during the first or second year of the five-year displacement window and were then displaced again during the next three years were supposed to report the first displacement if they had longer tenure on the first lost job than on the subsequent lost job. Such workers would not be counted as displaced during the previous three years. In the 1994–98 DWSs, such workers would always report the second lost job and be counted as displaced during the previous three years.

We correct for the change in the DWS displacement interval using the method developed by Farber (1997). Using data from the Panel Study of Income Dynamics (PSID), Farber calculated that workers displaced in a given year have a 0.3017% probability, on average, of being displaced again over the next three years. For workers displaced a year ago, the average probability of being displaced again during the next three years is 0.2705. We reweight workers displaced four and five years ago in the 1986 and 1988 surveys using these probabilities. Individuals who report being displaced four or five years ago in the 1986 and 1988 DWSs are included in the sample as displaced workers, with their CPS final weights multiplied by the probability of being displaced in the three years prior to the survey. These individuals were also included as non-displaced workers, with their weights multiplied by one minus the probability of being displaced in the three years prior to the survey.[2]

[1]Other studies of displacement have also focused on workers displaced for these three reasons, for example, Fairlie and Kletzer (1998) and Podgursky and Swaim (1987). Abraham (1997) noted that only 24% to 31% of workers who said in the 1996 DWS that they were displaced for "other" reasons should be categorized as displaced, based on follow-up interviews.

[2]The results are similar if displaced individuals from the 1986 and 1988 DWSs are not reweighted using Farber's method of correcting for the change in the displacement window or if individuals who reported being displaced four or five years ago are not included in the sample. Our investigation of the PSID indicated that younger workers were more likely to experience repeat displacement than were older workers, suggesting that the decline in displacement among younger workers relative to older workers may have been even larger than documented here.

The sample used here from the four DWSs includes individuals who reported having been displaced as well as non-displaced individuals who were employed at the time of the survey. Individuals who were not employed at the time of the survey and did not report being displaced are not included in the sample.[3] We include individuals aged 25–64 at the time of the survey and categorize them into four 10-year age groups in most of the analysis.[4] The sample includes both men and women. We combine the 1986 and 1988 DWSs, which together include displacements during 1983–87, and the 1996 and 1998 DWSs, which cover displacements from 1993 through 1997. Other DWSs are excluded in order to limit the effect of examining different phases of the business cycle, but the results are robust when observations from the 1984, 1990, and 1992 DWSs are included and when the 1981–89 period is compared to the 1990–97 period.

Although the displacement window in the DWS has changed over time, DWS data have several advantages over data from the PSID, the other main survey used to study displacement. The tenure questions in the PSID have changed over time and contain substantial measurement error, making it difficult to determine whether a worker has been displaced (Brown and Light 1992). In addition, workers who are laid off or fired are classified together in the PSID, and there is a separate classification for workers who lost a job because of plant closure or other similar reasons. The laid off or fired category mixes workers whom previous researchers have usually treated as involuntarily displaced (laid off) with workers they have not regarded as such (fired). The PSID also includes employment histories only for household heads (and, since 1979, "wives").[5]

Descriptive Statistics

Table 1 reports the percentage of workers who reported being displaced in the three previous years by 10-year age groups and by other characteristics (Appendix Table A1 reports sample means). Data from the 1986 and 1988 DWSs combined, which cover displacement during the period 1983–87, indicate that about 7.4% of workers were displaced because of plant closure, job abolishment, or slack work during the three years prior to those surveys. Combining the 1996 and 1998 DWSs, which cover displacement between 1993 and 1997, results in a three-year displacement rate of about 7.2%. These displacement rates are calculated as the ratio of workers displaced during the three years prior to the survey to non-displaced, currently employed individuals plus displaced workers.

Middle-aged workers were slightly more likely to have been displaced during the 1990s than during the 1980s. The displacement rate among workers aged 35–44 and 45–54 was higher in 1993–97 than in 1983–87, although the increases are not statisti-

[3]We want to measure the likelihood of displacement given employment during the displacement interval. As in previous studies, we use workers employed at the survey date (and displaced workers) as the relevant pool of workers within the displacement window.

[4]Differences across age groups were clearest using the four 10-year age groups. Using other age categories, such as combining workers aged 35–54 or workers aged 45–64, resulted in lower goodness-of-fit measures in linear probability regressions examining the likelihood of displacement. We exclude workers under age 25 in order to focus attention on individuals who, for the most part, had completed their education and were permanently attached to the labor force.

[5]The PSID also has several advantages over the DWS. The PSID has a shorter recall period than the DWS, which is known to have problems with underreporting of displacement events that occurred during the early part of the displacement interval (Fairlie and Kletzer 1996). The panel nature of the PSID allows for an examination of the relationship between characteristics at the beginning of an interval and subsequent displacement experience, whereas the DWS reports characteristics at the time of the survey and retrospective displacement experience. However, attrition from the PSID may limit the advantages of the survey's longer panel.

cally significant. Displacement rates declined significantly among workers aged 25–34, while the displacement rate among workers aged 55–64 did not change. Relative to the change in displacement rates among young workers, the displacement rate among middle-aged and older workers was therefore higher in 1993–97 than in 1983–87. However, displacement rates continued to decline monotonically with age.

The descriptive statistics also indicate that the distribution of educational attainment among displaced workers changed over time. The incidence of displacement among workers who graduated from college rose significantly, both absolutely and relative to less educated workers. Workers who had some college education experienced a small, statistically insignificant increase in displacement. Displacement rates declined among workers who did not attend college, and the decline was statistically significant among high school graduates. As Table 1 indicates, despite the large increase in displacement rates among college graduates, these workers remained less likely to be displaced than workers who did not have a college degree.

Sizable changes in the likelihood of displacement also occurred across broad industry classifications. The incidence of displacement in the service sector rose between the 1980s and the 1990s, both absolutely and relative to the incidence of displacement in the goods-producing sector.[6] Displacement rates increased for women and declined for men, narrowing the gender gap in displacement.

Although Table 1 indicates several statistically significant changes in the incidence of displacement, it only presents univariate results. Changes in displacement rates within age or education groups may be due to changes in the characteristics of workers within those groups. For example, the descriptive statistics suggest an increase in displacement among middle-aged workers and indicate that displacement rates decline with educational attainment. If younger workers had more education in 1993–97 than in 1983–87 relative to middle-aged workers, the change in relative dis-

Table 1. Incidence of Displacement by Characteristics and Period (percent).

Incidence by:	*1983–87*	*1993–97*	*Diff.*
Entire sample:	7.4	7.2	–0.2
Age:			
Age 25–34	8.8	8.3	–0.5**
Age 35–44	7.0	7.2	0.2
Age 45–54	6.1	6.5	0.4
Age 55–64	6.0	6.0	0.0
Sex:			
Male	8.2	7.5	–0.7***
Female	6.3	6.9	0.6***
Race:			
White	7.3	7.2	–0.1
Nonwhite	8.0	7.5	–0.5
Marital Status:			
Married	6.8	6.4	–0.4
Not Married	8.6	8.8	0.2
Education:			
Not High School Graduate	10.1	9.4	–0.7
High School Graduate	8.1	7.4	–0.7***
Some College	7.6	7.9	0.3
College Graduate	5.1	6.1	1.0***
Post-Graduate	3.7	4.6	0.9***
Industry:			
Goods-Producing	12.5	9.8	–2.7***
Service-Producing	5.0	6.2	1.2***

Notes: Shown is the percentage of workers who report being displaced among workers with the given characteristic. The 1983–87 sample includes workers from the 1986 and 1988 DWSs, and the 1993–97 sample includes workers from the 1996 and 1998 DWSs. Workers are considered displaced if they reported losing or leaving a job because the plant was closed, the job was abolished, or there was slack work in the three years prior to the survey. Observations are weighted using the sample final weights.

Source: Authors' calculations from CPS DWSs.

**Statistically significant at the .05 level; ***at the .01 level.

[6]Goods-producing industries include agriculture, mining, construction, and manufacturing; service-producing industries include transportation, communications and public utilities, wholesale and retail trade, finance, insurance and real estate, services, and public administration. The pre-displacement industry is used for displaced workers and the current industry for non-displaced workers.

Table 2. Estimates of Determinants of the Probability of Displacement. (Standard Errors in Parentheses)

Covariate:	*1983–87*	*1993–97*	*Diff.*
Age 35–44	–.014***	–.009***	.005
	(.002)	(.002)	(.003)
Age 45–54	–.026***	–.014***	.013***
	(.002)	(.002)	(.003)
Age 55–64	–.029***	–.020***	.009**
	(.003)	(.003)	(.004)
Female	–.007***	.001	.007**
	(.002)	(.002)	(.002)
Nonwhite	.003	–.001	–.003
	(.002)	(.003)	(.003)
Married	–.018***	–.022***	.003
	(.002)	(.002)	(.003)
High School	–.013***	–.015***	–.002
Graduate	(.002)	(.003)	(.004)
Some College	–.016***	–.009**	.008
	(.003)	(.003)	(.004)
College	–.037***	–.026***	.012***
Graduate	(.003)	(.004)	(.005)
Post-Graduate	–.043***	–.035***	.008
	(.003)	(.004)	(.005)
Goods-	.069***	.033***	–.035***
Producing	(.002)	(.002)	(.003)
Constant	.083***	.108***	.025***
	(.003)	(.004)	(.005)
N	111,758	86,098	—
Adjusted R^2	.025	.009	—

Notes: The 1983–87 sample includes workers from the 1986 and 1988 DWSs, and the 1993–97 sample includes workers from the 1996 and 1998 DWSs. The reference categories are age 25–34, male, white, unmarried, and not high school graduate. The regressions are linear probability models and also include 3 of 4 region dummy variables. Observations are weighted using the sample final weights.

**Statistically significant at the .05 level; ***at the .01 level.

Source: Authors' calculations from CPS DWSs.

placement rates suggested by the descriptive statistics might be due to changes in average educational attainment across age groups, not to changes in the relative probability of displacement by age. Multivariate analysis is needed to control for such factors.

We estimated linear probability regressions of the probability of displacement, controlling for observable characteristics that may affect the likelihood of displacement. We present results from separate regressions for workers from the 1986/1988 DWSs and for workers from the 1996/1998 DWSs and focus on the change in the estimated coefficients between the two periods. The dependent variable in each regression is equal to one if an individual reported being displaced because of plant closure, job abolishment, or slack work, and zero otherwise.[7] Table 2 reports the estimated coefficients for each period and the differences between the coefficients over time.

The results indicate that older and more educated workers were less likely to be displaced than were younger and less educated workers. As columns (1) and (2) show, the likelihood of displacement declined across age groups as age increased during both 1983–87 and 1993–97. The probability of displacement also generally declined as educational attainment increased, although the coefficients for the 1993–97 periods are not monotonically decreasing. These results are similar to those reported by Farber (1997).

The relative probability of displacement was slightly higher for middle-aged and older workers in 1993–97 than in 1983–87. The third column in Table 2 reports the difference between the 1993–97 coefficients and the 1983–87 coefficients. The relative probability of displacement among workers aged 35–44 rose by about 0.5 percentage points during this period, but the increase is not statistically significant. For workers aged 45 and older, the increases in the relative probability of displacement are larger and are significant at $p < .05$.

The results in Table 2 also suggest that the likelihood of displacement by educational attainment changed over time. Although displacement continued to be less

[7]In addition to the variables reported in Table 2, the regressions include indicator variables for 3 of 4 regions. The reference categories in Table 2 are age 25–34, male, white, not married, less than high school graduate, and service sector.

likely for educated workers than for less educated workers, the difference narrowed for education levels beyond high school. The likelihood that a college graduate was displaced, relative to the likelihood of displacement for a worker who did not finish high school, was 1.2 percentage points higher in 1993–97 than in 1983–87. Farber (1997) similarly noted that the relative probability of displacement has risen over time for college graduates.

The probability of displacement changed over time across broad industry groups. Although workers in goods-producing industries remained significantly more likely to be displaced than their counterparts in services, the difference narrowed. In results not shown here, controlling for industry at a more disaggregated level had little effect on the magnitude of the estimated changes in the other variables.[8] The relative probability of displacement also increased significantly over time for women relative to men. Other factors not captured by our model also changed over time, as indicated by the statistically significant increase in the constant.

These descriptive statistics and results indicate that the relative likelihood of displacement increased over time for middle-aged and older workers, for more educated workers, and for workers in service-producing industries. We next decompose changes in displacement rates into the component due to changes in the average characteristics of workers and that due to changes in the effects of those characteristics, both for all workers and by age group. We then discuss whether the relative increase in displacement among middle-aged and older workers was concentrated among high-skill or low-skill workers.

Factors Contributing to Changes in Displacement

The above results suggest that the age and education profile of displacement has changed over the past two decades, but it does not pinpoint the source of these changes. The change in the incidence of displacement for workers within an age group may be due to changes in the characteristics of workers in that age group or to changes in the relationship between those characteristics and the probability of displacement.

To assess the role of these factors in the relative increase in displacement among middle-aged and older workers, we performed a Oaxaca decomposition for all workers and for each 10-year age group. This method decomposes the change in the displacement rate over time into the change due to changes in coefficients over time and the change due to changes in variable means over time, or

$$(1)\qquad \bar{Y}_{93\text{–}97} - \bar{Y}_{83\text{–}87} = \bar{X}_{93\text{–}97}(\hat{\beta}_{93\text{–}97} - \hat{\beta}_{83\text{–}87}) + \hat{\beta}_{83\text{–}87}(\bar{X}_{93\text{–}97} - \bar{X}_{83\text{–}87}).$$

The first term on the right-hand side of equation (1) gives the change in displacement rates due to changes over time in the coefficients, evaluated at the 1993–97 sample means, and the second term gives the change due to changes over time in the variable means, evaluated at the 1983–87 coefficients. The decompositions are based on coefficients from linear probability models like those shown in the first two columns of Table 2.[9]

Panel A of Table 3 reports the decomposition results. Changes in variable means

[8]We do not present results with more detailed industry controls, because the industrial mix of workers may have changed during the displacement interval. Ideally, we would use the industry of non-displaced workers within the three-year displacement window, but that information is not available. The regressions with the more detailed controls included 11 industry indicator variables. Regressions controlling for occupation using either a blue-collar dummy variable or six occupation variables gave similar results but reduced the magnitude and statistical significance of the estimated coefficients on the education variables, which are highly collinear with occupational distribution.

[9]The standard errors for the Oaxaca decomposition are calculated using the method described in Oaxaca and Ransom (1998).

Table 3. Decomposition of Percentage Point Change in Displacement Probabilities over Time. (Standard Errors in Parentheses)

Change Measure	*All*	*25–34*	*35–44*	*45–54*	*55–64*
A. Total Change	–.16	–.50**	.18	.41	–.02
	(.12)	(.23)	(.21)	(.25)	(.32)
Change Due to Changes in All Coefficients	.40***	–.07	.25	.91***	.41
	(.12)	(.23)	(.21)	(.24)	(.31)
Change Due to Changes in All Variable Means	–.56***	–.42***	–.07	–.50***	–.44***
	(.03)	(.04)	(.04)	(.07)	(.07)
B. Change Due to Educational Variables	.27	–.12	–.35	.85	.18
	(.34)	(.71)	(.64)	(.65)	(.68)
Change Due to Changes in Education Coefficients	.45	.08	.35	1.07	.36
	(.34)	(.71)	(.64)	(.65)	(.68)
Change Due to Changes in Education Variable Means	–.18***	–.21***	.01	–.22***	–.18***
	(.02)	(.03)	(.03)	(.06)	(.07)
C. Change Due to Industry Variable	–1.29***	–1.60***	–1.12***	–1.10***	–1.17***
	(.07)	(.14)	(.13)	(.14)	(.19)
Change Due to Change in Industry Coefficient	–.97***	–1.23***	–.95***	–.69***	–.82***
	(.07)	(.14)	(.13)	(.14)	(.19)
Change Due to Change in Industry Mean	–.32***	–.38***	–.17***	–.41***	–.35***
	(.01)	(.02)	(.01)	(.02)	(.02)

Notes: Shown are the estimated changes in the displacement rate for all workers and for each age group. The change is decomposed into the change due to changes in coefficients, evaluated at the 1993–97 sample means, and the change due to changes in variable means, evaluated at the 1983–87 coefficients.

**Statistically significant at the .05 level; ***at the .01 level.

Source: Authors' calculations from CPS DWSs.

generally acted to lower the displacement rate, whereas changes in coefficients boosted the displacement rate among some age groups. Absent changes in the coefficients, the changes in average characteristics would have caused the overall displacement rate to fall by over half a percentage point between 1983–87 and 1993–97 (column 1, row 3). Changes in average characteristics significantly lowered the displacement rate among each age group except for ages 35–44. Changes in the relationship between characteristics and displacement, in contrast, acted to raise the overall displacement rate by about 0.4 percentage points. The change in coefficients appears concentrated among workers aged 45–54, with this age group showing a statistically significant overall effect of changes in coefficients of 0.91 percentage points.[10]

The above decomposition does not indicate the individual contributions of various characteristics to the estimated changes in displacement probabilities over time. Changes in educational attainment, industry, or other factors—or changes in the effects of such variables—could underlie the changes in displacement rates. Table 3 therefore also reports the contribution of education and industry to changes in the incidence of displacement.[11] We focus on these factors because they played a substan-

[10]We note that the age group 35–44 is clearly anomalous in Table 3; this age group is primarily composed of baby boomers, who have experienced lower returns to education than other cohorts (Welch 1979).

[11]The decomposition was performed as in equation (1), but only education or industry variables were included when calculating the decomposition. Note that the education and industry results do not sum up to the total results because other variables were also included in the model.

tial role in the changes that occurred within and across age groups.

Panel B of Table 3 indicates that changes in average educational attainment generally exerted downward pressure on displacement rates. If all factors except the distribution of educational attainment had remained constant, the overall displacement rate would have fallen by almost 0.2 percentage points. Downward pressure of a similar magnitude occurred among each age group except workers aged 35–44. Increases in average educational attainment among the other age groups likely account for this downward pressure on displacement rates, because more educated workers are less likely to be displaced. Changes in the relationship between education and displacement did not have statistically significant effects on displacement rates.

Industry appears to have played a sizable role in the changes in displacement rates. Panel C indicates that compositional shifts between goods-producing and service-producing jobs exerted a negative influence on displacement rates among all age groups; the increased share of employment in the service sector lowered the average incidence of displacement. Changes in the relationship between displacement and industry also acted to lower displacement rates for all age groups; the magnitude of the effect is largest for workers aged 25–34, at 1.23 percentage points.

The decomposition does not clearly indicate which factors contributed to the relative increase in displacement rates among middle-aged and older workers that is evident in Table 2 and instead suggests that several factors put downward pressure on displacement rates. However, a comparison of the magnitude of the various effects across age groups indicates that changes in the relationship between industry and displacement were largest among the youngest workers, suggesting differences across age groups in changes in coefficients. To further investigate this issue, we estimated linear probability models of displacement separately for each age group, in regressions that include all of the variables included in the earlier regressions. The results are shown in Table 4, which reports the differences between the variable coefficients for the two periods.

Table 4. Estimates of Determinants of Changes in the Probability of Displacement, by Age. (Standard Errors in Parentheses)

Covariate	*25–34*	*35–44*	*45–54*	*55–64*
Female	.015***	.011**	–.002	–.010
	(.005)	(.004)	(.005)	(.006)
Nonwhite	–.007	–.003	.015	–.015
	(.006)	(.006)	(.007)	(.010)
Married	–.002	–.004	–.003	–.007
	(.005)	(.005)	(.005)	(.007)
High School Graduate	–.005	–.001	.005	–.004
	(.008)	(.007)	(.008)	(.009)
Some College	.008	–.003	.019**	.011
	(.009)	(.008)	(.009)	(.010)
College Graduate	.003	.018**	.009	.014
	(.009)	(.008)	(.009)	(.011)
Post-Graduate	–.008	.010	.016	.005
	(.011)	(.009)	(.009)	(.012)
Goods-Producing	–.045***	–.034***	–.026***	–.030***
	(.005)	(.005)	(.005)	(.007)
Constant	.034***	.026***	.022**	.043***
	(.010)	(.009)	(.010)	(.012)
N	65,174	62,449	44,693	25,540

Notes: Shown are the differences in the coefficients for the two periods from linear probability regressions for each age group. The regressions also include 3 of 4 region dummy variables. Observations are weighted using the sample final weights.

**Statistically significant at the .05 level; ***at the .01 level.

Source: Authors' calculations from CPS DWSs.

The results indicate several differences across age groups in changes in the relationship between characteristics and displacement. As suggested by the decomposition results, the decline in the probability of displacement for goods-producing workers relative to service-producing workers was larger for workers aged 25–34 than for the other age groups, although the effect was statistically significant for each age group. The gender gap in displacement rates narrowed significantly among workers aged 25–44 but not among workers aged 45–64. The results also suggest that displacement rates may have increased for workers who had attended at least some college among middle-aged workers. Work-

ers aged 45–54 who attended some college experienced a statistically significant increase in the probability of displacement over time relative to workers who did not finish high school, and college graduates aged 35–44 experienced a statistically significant relative increase in the probability of displacement. None of the changes in the probability of displacement across educational groups were statistically significant for workers aged 25–34 or for workers aged 55–64. In addition, none of the changes within education groups are significantly different across age groups.

The results for the education variables in Tables 3 and 4 appear inconsistent with the hypothesis that increased demand for skilled workers contributed to the relative increase in displacement among middle-aged and older workers. The decomposition results in Table 3 suggest that changes in average educational attainment exerted downward pressure on the displacement rates as higher average educational attainment within age groups led to lower displacement rates than otherwise would have occurred. In addition, Table 4 suggests that the relative increase in displacement rates was, if anything, concentrated among workers who had attended college, although many of the differences for the education variables are not statistically significant. None of the results suggest that the probability of displacement increased among less educated older workers relative to other workers.

Table 4 also indicates that the probability of displacement fell for goods-producing workers relative to their counterparts in the service sector. Although the change is statistically significant in each age group, its magnitude is largest for workers aged 25–34. Thus, one possible explanation for the relative increase in displacement among older workers is differences across age groups in the change in the relationship between displacement and industry. The decomposition results in Table 3 also support this possibility.

The constant in the regressions increases over time for all of the age groups, although the changes are not significantly different across age groups. This increase in the constant, which measures factors not captured by the other variables, implies that there was an increase in the displacement rate within each age group after we control for other factors. However, the descriptive statistics in Table 1 indicate that the overall displacement rate fell between 1983–87 and 1993–97. The decline in the total displacement rate is therefore due to compositional changes in the labor force, with an increasing proportion of the labor force in demographic groups with lower displacement rates, such as older and more educated workers.

Conclusions

Using data from the 1986, 1988, 1996, and 1998 Displaced Workers Surveys, we have examined changes in the demographic profile of displaced workers over time. Over the years studied, we find that changes in the distribution of educational attainment and industry acted to lower displacement rates among most age groups, including older workers, as average educational attainment increased and employment shifted from goods-producing to service-producing industries. Furthermore, the incidence of displacement remained lower among older workers than among younger workers. On the other hand, consistent with anecdotal evidence that middle-aged workers were more likely to be displaced during the 1990s than during the 1980s, the results also indicate that the incidence of displacement rose among workers aged 35 and older *relative to* younger workers, with the largest relative increase occurring among workers aged 45–54. We fail to find that differences across age groups in the relationship between displacement and demographic characteristics are the likely explanation for this shift. The incidence of displacement also rose among more educated workers relative to less educated workers—a result seemingly at odds with findings that skill-biased technological change has increased the demand for more educated workers, which presumably would lower the relative likelihood of displacement among those workers.

Appendix Table A1
Sample Means for Covariates, by Period

Variable	*1983–87*	*1993–97*
Age 25–34	.370	.296
Not Married	.302	.330
Age 35–44	.300	.335
Not High School Graduate	.146	.097
Age 45–54	.199	.250
High School Graduate	.371	.323
Age 55–64	.131	.119
Some College	.227	.280
Male	.557	.535
College Graduate	.138	.198
Female	.443	.465
Post Graduate	.118	.102
White	.867	.853
Goods Producing	.319	.273
Nonwhite	.133	.147
Service Producing	.681	.727
Married	.698	.670
Number of Observations	111,758	86,098

Notes: Shown are weighted sample means. The 1983–87 sample includes workers from the 1986 and 1988 DWSs, and the 1993–97 sample includes workers from the 1996 and 1998 DWSs. Observations are weighted using the sample final weights.

Source: Authors' calculations from CPS DWSs.

REFERENCES

Aaronson, Daniel, and Kenneth Housinger. 1999. "The Impact of Technology on Displacement and Reemployment." *Federal Reserve Bank of Chicago Economic Perspectives,* Vol. 23, No. 2, pp. 14–30.

Aaronson, Daniel, and Daniel G. Sullivan. 1998. "Recent Trends in Job Displacement." *Chicago Fed Letter* No. 136 (December).

Abraham, Katharine. 1997. "Comment on 'The Changing Face of Job Loss in the United States, 1981–1995.'" *Brookings Papers on Economics Activity: Microeconomics,* pp. 135–41.

Autor, David H., Lawrence F. Katz, and Alan B. Krueger. 1998. "Computing Inequality: Have Computers Changed the Labor Market?" *Quarterly Journal of Economics,* Vol. 113, No. 4 (November), pp. 1169–1213.

Becker, Gary. 1975. *Human Capital.* New York: Columbia University Press.

Bishop, John. 1998. "Occupation-Specific versus General Education and Training." *Annals of the American Academy of Political and Social Science,* Vol. 559 (September), pp. 24–38.

Berger, Mark C. 1984. "Cohort Size and the Earnings Growth of Young Workers." *Industrial and Labor Relations Review,* Vol. 37, No. 4 (July), pp. 582-591.

Boisjoly, Johanne, Greg J. Duncan, and Timothy Smeeding. 1998. "The Shifting Incidence of Involuntary Job Losses from 1968 to 1992." *Industrial Relations,* Vol. 37, No. 2 (April), pp. 207–31.

Brown, James N., and Audrey Light. 1992. "Interpreting Panel Data on Job Tenure." *Journal of Labor Economics,* Vol. 10, No. 3 (July), pp. 219–57.

Fairlie, Robert W., and Lori G. Kletzer. 1996. "Race and the Shifting Burden of Job Loss over the 1980s." *Monthly Labor Review,* Vol. 119, No. 9 (September), pp. 13–23.

____. 1998. "Jobs Lost, Jobs Regained: An Analysis of Black/White Differences in Job Displacement in the 1980s." *Industrial Relations,* Vol. 37, No. 4 (October), pp. 460–77.

Farber, Henry S. 1993. "The Incidence and Costs of Job Loss, 1982–91." *Brookings Papers on Economic Activity: Microeconomics,* pp. 73–119.

____. 1997. "The Changing Face of Job Loss in the United States, 1981–1995." *Brookings Papers on Economic Activity: Microeconomics,* pp. 55–128.

Gottschalk, Peter. 1997. "Inequality, Income Growth, and Mobility: The Basic Facts." *Journal of Economic Perspectives,* Vol. 11, No. 2 (Spring), pp. 21–40.

Gottschalk, Peter, and Robert Moffitt. 1999. "Job Instability and Insecurity for Males and Females in the 1980s and 1990s." Mimeo, Boston College,

January.
Freeman, Richard B. 1979. "The Effect of Demographic Factors on the Age-Earnings Profile in the U.S." *Journal of Human Resources*, Vol. 14, No. 3 (Summer), pp. 289-318.
Kletzer, Lori G. 1998. "Job Displacement." *Journal of Economic Perspectives*, Vol. 12, No. 1 (Winter), pp. 115–36.
Labich, Kenneth. 1993. "The New Unemployed." *Fortune,* March 8, pp. 40–49.
Levy, Frank, and Richard J. Murnane. 1992. "U.S. Earnings Levels and Earnings Inequality: A Review of Recent Trends and Proposed Explanations." *Journal of Economic Literature*, Vol. 30, No. 3, pp. 1333–81.
Marcotte, Dave E. 2000. "Continuing Education, Job Training, and the Growth of Earnings Inequality." *Industrial and Labor Relations Review,* Vol. 53, No. 4 (July), pp. 602–23.
Munk, Nina. 1999. "Finished at Forty." *Fortune,* February 1, pp. 50–66.
Oaxaca, Ronald L., and Michael R. Ransom . 1998. "Calculation of Approximate Variances for Wage decomposition Differentials." *Journal of Economic and Social Measurement,* Vol. 24, No. 1, pp. 55–61.
Podgursky, Michael, and Paul Swaim. 1987. "Job Displacement and Earnings Loss: Evidence from the Displaced Worker Survey." *Industrial and Labor Relations Review,* Vol. 41, No. 1 (October), pp. 17–29.
Polsky, Daniel. 1999. "Changing Consequences of Job Separation in the United States." *Industrial and Labor Relations Review,* Vol. 52, No. 4 (July), pp. 565–80.
Siegel, Michele, Charlotte Muller, and Marjorie Honig. 2000. "The Incidence of Job Loss: The Shift from Younger to Older Workers, 1981–1996." International Longevity Center Working Paper No. 2000-03.
Topel, Robert. 1991. "Specific Capital, Mobility, and Wages: Wages Rise with Job Seniority." *Journal of Political Economy,* Vol. 99 (February), pp. 145–75.
Welch, Finis. 1979. "Effects of Cohort Size on Earnings: The Baby Boom Babies' Financial Bust." *Journal of Political Economy,* Vol. 87, No. 5, Part 2 (October), pp. S65–S97.