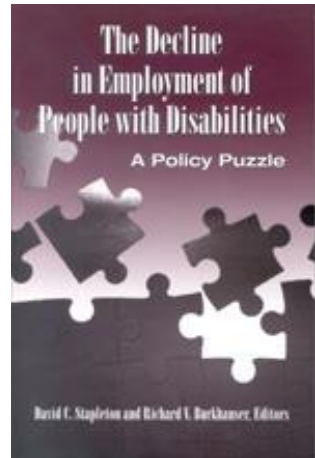

Upjohn Institute Press

Have Changes in the Nature of Work or the Labor Market Reduced Employment Prospects of Workers with Disabilities?

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Chapter 4 (pp. 125-180) in:

The Decline in Employment of People with Disabilities: A Policy Puzzle

David C. Stapleton, and Richard V. Burkhauser, eds.

Kalamazoo, MI: W.E. Upjohn Institute for Employment Research, 2003

DOI: 10.17848/9780585473666.ch4

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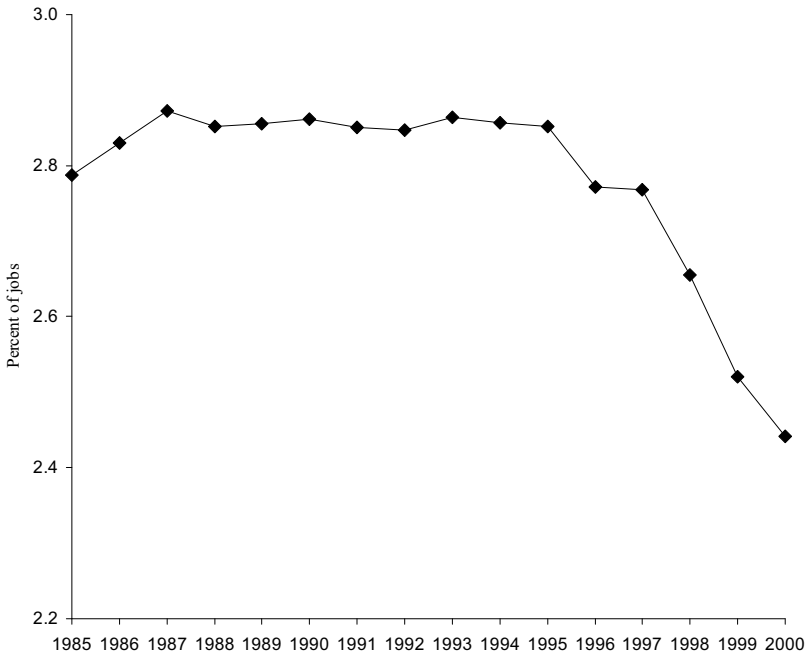
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According to conventional wisdom, the world of work has changed dramatically in response to globalization and technological change. Companies are restructuring, reorganizing, reinventing, and demanding different skills from their workers. At the same time, the conventional wisdom tells us that the long-term relationship between employer and employee is dead and that we should expect to change professions three times, and jobs six times, over our working lives. Although the conventional wisdom may be overstated, the nature of work is clearly changing, and the labor market is in constant flux. Some allege that recent changes have made it more difficult for people with disabilities to compete for jobs, while others claim the opposite. Because people with disabilities are widely diverse, both could be right.

Beginning in 1990, the employment rate of men and women with disabilities fell relative to that of the rest of the working-aged population (see Chapter 2). In this chapter, we look at this decline from a somewhat different perspective. We consider the decline in the percentage of jobs filled by workers who report work limitations and how that might be related to changes in the nature of those jobs.

The trend in the percentage of jobs filled by workers with limitations reflects the trend in the employment rate for people with disabilities, although there are important qualitative differences (Figure 4.1).¹ After hovering at just above 2.8 percent from 1985 to 1995, the three-

Figure 4.1 Three-Year Moving Average of Percentage of Jobs Filled by Workers with Work Limitations



SOURCE: Authors' calculations based on the 1991 *Dictionary of Occupational Titles* job characteristics merged with CPS March Supplement 1985–2000.

year moving average started to fall. By comparison, the decline in the employment rate of people with disabilities starts in 1990. The fall in the percentage of jobs filled by workers with limitations is especially precipitous from 1998 to 2000, and by 2000, the percentage was below 2.5 percent.² This decline coincided with an economic expansion, but a similar decline did not occur during the expansion of 1985–1989.

This chapter considers whether changes in the nature of work might account for the decline. On the one hand, it seems that the increasing technical skills demanded by employers would disadvantage people with disabilities who, on average, attain substantially less schooling. It also is widely believed that work is becoming more stressful, requiring greater adaptability on the part of the employee, again to

the disadvantage of people with disabilities. On the other hand, the physical demands of work have declined, and information and other technologies might have made it easier for people with disabilities to compete.

We distinguish between two aspects of work. The first is the “static” aspect. This refers to what we would see workers doing, what qualifications they would have, and what their work environment would look like if we took a snapshot of them at a point in time. Clearly, a snapshot taken today would show a much different set of activities, qualifications, and environments than a snapshot taken 20, or even 10, years ago.³ We can then ask if, relative to workers without disabilities, workers with disabilities are more or less qualified to perform the activities seen in today’s snapshot than in snapshots taken one or two decades ago.

The second is the “dynamic” aspect of work. This refers to the features of change itself as work moves from what we see in one snapshot to what we see in a later one—that is, what we would see in the motion picture besides just a series of snapshots. To what extent do workers need to perform new activities to be successful? Do they need to retrain often? How often do they need to change employers? Frequent or unpredictable changes such as these might disadvantage most workers with disabilities relative to workers without disabilities because of the role that the environment plays in determining whether a physical or mental condition is accompanied by a work limitation. Even when the final result of the change is a very positive one for the person with a disability (e.g., a better job), the process of change itself (e.g., finding the new job and adapting to it) might be very difficult.⁴

Clearly, it is critical to recognize the diversity of people with disabilities when considering this issue—diversity in age of onset, education, work experience, family supports, as well as diversity in physical or mental conditions. Our limited task, however, is to assess the extent to which changes in the characteristics of work might have contributed to the overall decline in the employment rate. Future work that focuses on specific subgroups could be of substantial value.

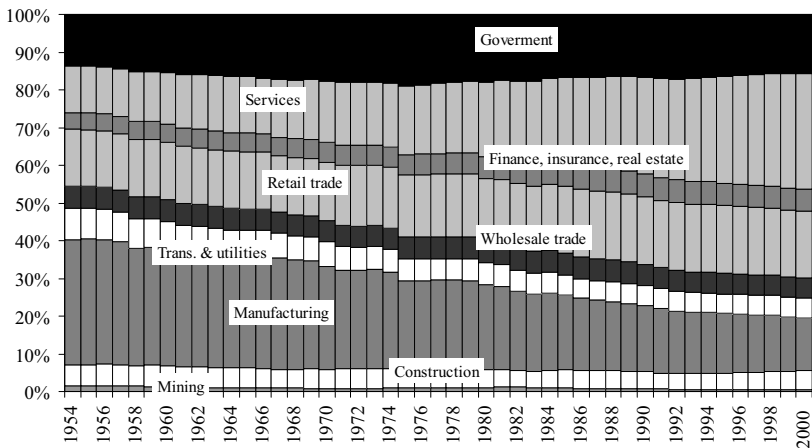
In the next section, we present empirical evidence on how static job characteristics have changed, the relationship between those characteristics and the percentage of workers with limitations in an occupation, and the effects of changes in job characteristics on the overall

percentage of workers with limitations. We follow with what we know about how the dynamic aspects of work have changed, and discuss possible implications.

THE STATIC ASPECTS OF WORK

There can be little doubt that static job characteristics have changed substantially in the last two decades because of both compositional shifts (the creation or elimination of jobs in specific occupations and the distribution of people among occupations) and changes in the content of work within occupations. Compositional shifts occur, in part, because of industry shifts. One of the most dramatic shifts is from manufacturing to a service economy (Figure 4.2). The percentage of jobs in manufacturing declined steadily over four and one-half decades, from 33 percent in 1954 to 14 percent in 2000, accompanied by a comparable increase in the percentage of service jobs, from 12 percent to 31 percent.

Figure 4.2 Distribution of Employment by Industry, 1954–2000



SOURCE: Council of Economic Advisors (2000).

Compositional changes also occur within industries. Many of the changes in occupations within an industry are designed to take advantage of new information technologies and changes in management techniques. For example, more reliance on automated technologies in the goods-producing sector has increased the number of jobs that require abstract reasoning ability and decreased the number of jobs that require physical strength. In the service sector, changes in management techniques have resulted in an increase in both high-skilled, high-wage jobs and low-skilled, low-wage jobs, with a decline in medium-skilled, medium-wage jobs (Howell and Wolff 1991; Gittleman and Howell 1995).

Although changes in the composition of occupations are quantifiable, changes in job characteristics that have occurred within occupations are difficult to measure, and may vary dramatically across occupations and for different definitions of skill.

We consider six dimensions of job characteristics (Table 4.1).⁵ For each characteristic, we discuss evidence about how the mean characteristic has changed for all jobs, the relationship between the characteristic and whether a specific job is filled by a worker with a limitation at a point in time, and evidence that change in the mean characteristics affects the percentage of all jobs filled by workers with limitations. To conduct this analysis, we developed a database using the Current Population Survey (CPS) for 1983 through 2000, the 1991 *Dictionary of Occupational Titles* (DOT), and other sources. We view each observation of an employed person in the CPS as an observation of a job. Because the survey is designed as a nationally representative sample of the population, it also provides a nationally representative sample of jobs. We matched the CPS respondent's occupation with job characteristics from DOT, educational requirements from the Bureau of Labor Statistics, and job mobility classifications developed by Kusmin and Gibbs (2000). Additional job characteristics were constructed using data from the CPS. (See Appendix 4A for details of the database.)

We report on 11 of the 93 characteristics developed for the analysis here (column 3 of Table 4.1), selected on the basis of three criteria. First, we computed simple correlations between the characteristic and an indicator for whether the job was held by a worker with a work limitation. We focused on measures that had significant correlations in pooled samples for at least two of the following three-year periods:

Table 4.1 Summary of Findings for Six Dimensions of Static Job Characteristics

Dimension	Definition	Operational measures ^a	Sign of change in measure's mean ^b	Relation to % of workers with limits ^c	Evidence of effect on % of workers with limits ^d
Substantive complexity	Level of cognitive skills required	GED language score	+	–	–
		Specific vocational preparation	+	–	–
		Repetitive tasks	–	+	none
Relational or interactive	Extent to which interactions with other workers and customers is critical to performance	Direct/control plan activities of others	+	–	none
Autonomy/control	Worker control of content, manner, and speed with which a task is done	None available	na	na	na
Task scope	Range or breadth of tasks	Bachelor's degree	+	–	none
		Dead end	–	+	none
Physical demands	Physical and manipulative skills required; environmental conditions	Strength score	–	+	none
Terms of employment	Benefits, hours worked, schedule flexibility, place of work, etc.	Full-year/full-time	+	–	none
		Employer-subsidized health insurance	–	–	mixed
		# of employees: 1,000+	+	?	mixed
		1– 24	–	+	mixed

- ^a Selected from database of 93 characteristics, based on the CPS, the DOT, Kusmin and Gibbs (2000), and BLS educational requirements.
- ^b Plus sign (+) indicates that three-year moving average of mean increased from 1990 to 2000, and minus sign (−) indicates it declined.
- ^c Sign indicated is the sign of the simple correlation between the measure and whether or not a job is held by a worker with a limitation, in each of three pooled CPS samples, covering three years each: 1983–1985, 1988–1990, 1998–2000; question mark (?) indicates variation in sign across samples. With two exceptions, the sign is the same in all three pooled samples and statistically significant at the 0.05 level in at least two of the three. The two exceptions are the employer size variables, which are only available in the last two of the three pooled samples. The correlation for 1,000+ employees is negative and significant in the 1988–1990 sample, but positive and not significant in the 1998–2000 sample. The correlation for 1–24 employees is positive in both samples, significant at the 0.01 level in 1988–1990, but only at the 0.10 level in 1998–2000.
- ^d Indicates our assessment of the evidence concerning the contribution of the change in the mean of the variable to the percentage of jobs filled by workers with limitations from 1990–2000. See text for the assessment.

1983–1985, 1988–1990, and 1999–2000. Second, we looked for characteristics that were conceptually different from each other, as it would be problematic to distinguish between the effects of characteristics that are conceptually very similar. Third, we looked for job characteristics for which the means have changed over time. (See Appendix 4A for a more detailed description of the process of selecting variables.)

An important limitation to this approach is that it captures changes in job characteristics caused only by changes in the composition of jobs; it does not capture any within-occupation changes in requirements over the period.

In the next section, we present trends in means for the selected characteristics in the context of broader discussions of each of the dimensions of job characteristics listed above. We also consider how these measures are related to whether a job is filled by a worker with a limitation at a point in time (i.e., in the cross-section). At the end of the section, we present an empirical assessment of the extent to which these characteristics are related to whether a job is filled by a worker with a limitation, as well as the extent to which the trend in the characteristic's mean could explain the decline in percentage of workers with limitations. Although it first appears that trends in several static characteristics might have played a role in the decline, based on trends in the mean characteristics and the simple correlations, more careful analysis suggests that most have not, and where we find effects, they appear to be small. We also discover some interesting changes in the relationships between whether a job is filled by a worker with a limitation and a few job characteristics, after controlling for others.

Changes in Static Job Characteristics

In this section, we describe what is known about changes in job characteristics within each of the six conceptual categories described above, what we found about changes in these characteristics from our analysis, and how changes might have affected employment opportunities of people with disabilities.

Substantive complexity

An increase in the demand for more-skilled versus less-skilled workers, at least in certain sectors of the economy, is well established

(U.S. Department of Labor 1999b). The cause of the change is a subject of debate.⁶ Two principal causes are cited in the literature: advances in technology; and globalization and international trade, spurred by the North American Free Trade Agreement (NAFTA) and the creation of the World Trade Organization (WTO), and resulting in greater competition from less-skilled labor in other countries (Dear-dorff 1998).

Technology substantially affects the way we work, but the impact varies dramatically by industry, job, and type of technology. Hence, it is unclear whether technology has, in the aggregate, increased or decreased necessary skills. Technology is best suited to replacing repetitive manual and cognitive tasks and for complementing tasks requiring nonroutine problem-solving. Accordingly, computers substitute for information processing, communication, and coordinating functions performed by clerks, cashiers, telephone operators, bank tellers, bookkeepers, and others who handle repetitive information (Autor, Levy, and Murnane 2001). For example, highly automated checkout machines have reduced the math and language skills required by cashiers, while computer-aided design has changed the types of skills required in the drafting trade. Disagreement exists about the overall effect of technology on skill requirements, but most agree that there are offsetting trends.⁷ Technology can replace low-skilled workers performing repetitive tasks, but it can also create opportunities for all workers to be more productive.⁸ Although some new opportunities might require little skill, many of these opportunities do require skill.

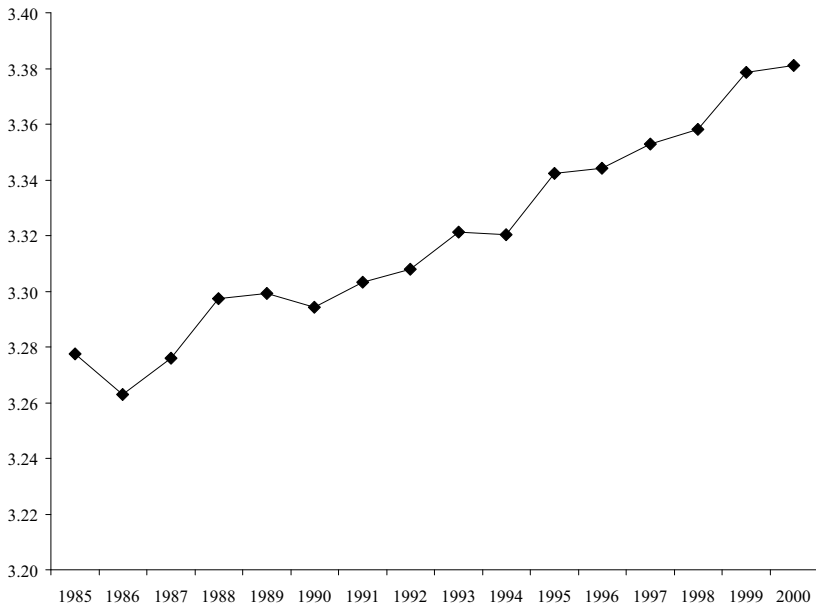
Ultimately, the effects of technology on job skill requirements also depend on consumer demand for goods or services. How much more do consumers demand as technology reduces prices and improves quality? To what extent does consumer demand for other goods and services change as a result, and what are the skill requirements in the production of those items?

We have selected three measures of substantive complexity from the DOT: 1) *GED-Language*, the aptitude required to perform adequately on the job as measured by scores on the language section of the General Aptitude Test Battery⁹; 2) *Specific Vocational Preparation*, the amount of vocational training time needed to learn how to perform a specific job; and 3) *Repeat*, a yes or no measure of whether the worker performs repetitive or short-cycle work.

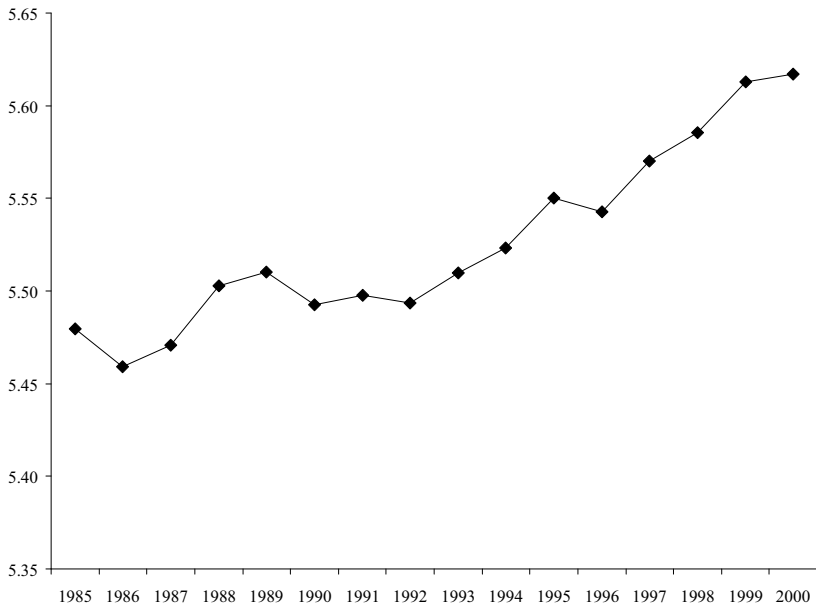
The average GED-language score and the average amount of specific vocational preparation required increased gradually between 1983 and 2000 (Figures 4.3 and 4.4). This finding is consistent with earlier findings reported by Spenner (1995). We also find that fewer jobs required very limited substantive complexity, as defined by the *repeat* measure (Figure 4.5).

It is likely that increased substantive complexity makes it more difficult for workers with disabilities to compete with others, on average, due to relatively low levels of education (see below) and mental conditions that limit learning. Of course, this does not apply to all people with disabilities, many of whom have the mental ability to perform highly complex tasks. Krueger, Drastal, and Kruse (1995) found that computer skills facilitate return to work for people who have suffered spinal cord injuries, but that many of those injured had no prior experi-

Figure 4.3 Mean of GED-Language, 1985–2000.



SOURCE: Authors' calculations based on 1991 *Dictionary of Occupational Titles* job characteristics merged with CPS March Supplement 1985–2000.

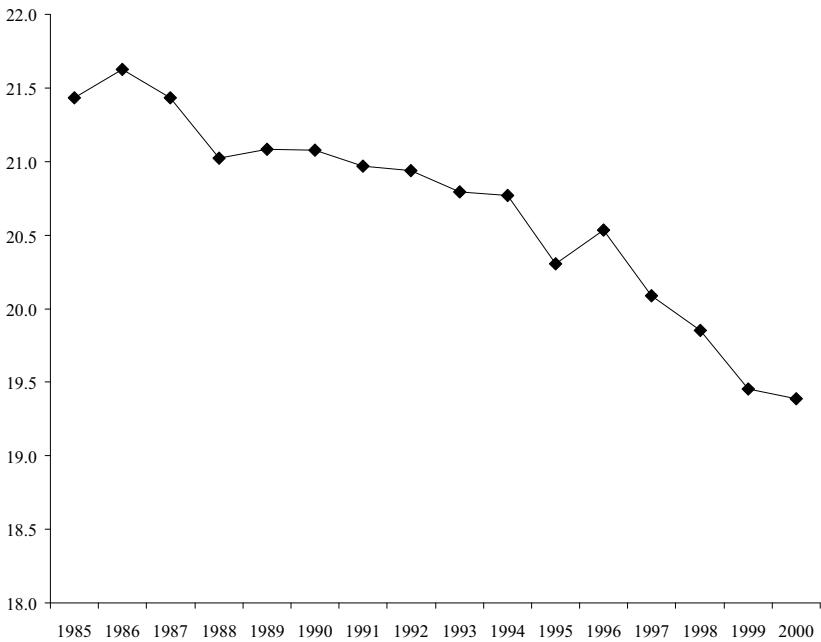
Figure 4.4 Mean of Specific Vocational Preparation

SOURCE: Authors' calculations based on 1991 *Dictionary of Occupational Titles* job characteristics merged with CPS March Supplement 1985–2000.

ence using computers. Kaye (2000) found a “digital divide,” with just under one-quarter of people with disabilities having a computer at home in 1998 compared with more than half of people without disabilities.

Relational/interactive

The interactive dimension of work has become more important as firms move toward more collaborative organizational forms. A number of studies have focused on the increased importance of interactive skills on both blue-collar and professional jobs, as team-based work structures become more common.¹⁰ In addition, the shift to service work, where interaction with customers is often fundamental to the job, has clearly increased the need for relational or interactive skills. We found that the percentage of jobs in which the worker “directs, controls

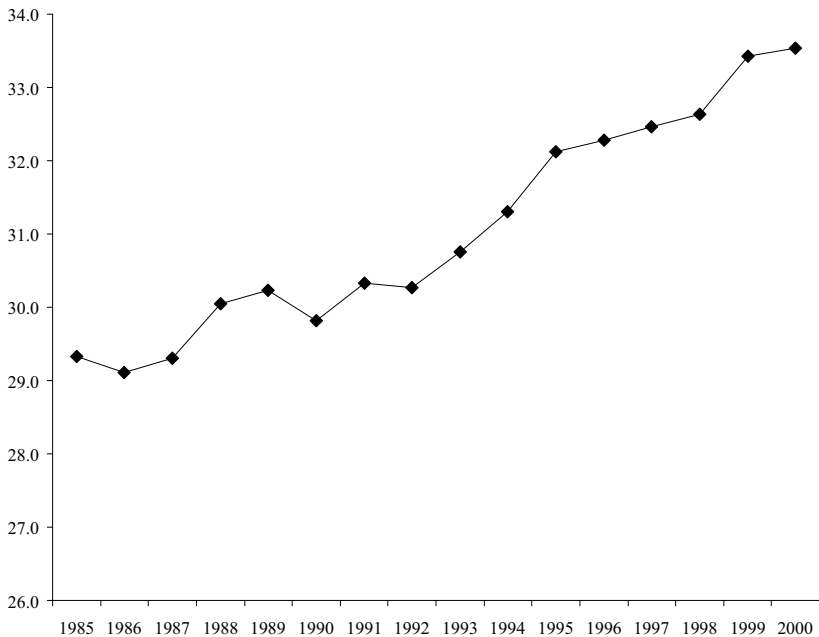
Figure 4.5 Percent of Jobs that Require Repetitive Tasks, 1985–2000

SOURCE: Authors' calculations based on 1991 *Dictionary of Occupational Titles* job characteristics merged with CPS March Supplement 1985–2000.

and/or plans the activities of others” has increased from 29 percent to nearly 34 percent between 1983 and 2000 (Figure 4.6).

Although little research is available on communication limitations for people with disabilities, it is likely that this particular skill requirement challenges not just those whose disability includes a language disorder or limitations in interpersonal skills, but the much broader disability community. Communication relies on understanding, acceptance, and mutual respect among team members. There is substantial evidence that the public continues to have negative attitudes toward people with disabilities (Loo 2001).

Figure 4.6 Percent of Jobs that Require Employee to Direct the Actions of Others, 1985–2000



SOURCE: Authors' calculations based on 1991 *Dictionary of Occupational Titles* job characteristics merged with CPS March Supplement 1985–2000.

Autonomy and control

Researchers disagree on whether there have been increases or decreases in workers' autonomy and control over their own work. On the one hand, workers who now participate in team decision-making have more autonomy and control than previously. On the other hand, technology has made many processes more routine, and in many instances allows management to better monitor and control the pace and quality of work.¹¹ Clearly, the level of autonomy varies greatly not only by occupation but also by organizational structure.¹²

The autonomy/control dimension of jobs is often overlooked in analyses of job characteristics (Spenner 1995), perhaps because it is difficult to measure. In fact, we were unable to find a measure of

autonomy/control for inclusion in our job characteristics database. Nonetheless, it might be a particularly important dimension for workers with disabilities.

The level of discretion and leeway that a job offers is likely to affect both the chance that an individual will develop a stress-related disability and the chance that an individual with a disability will be able to work. For example, Karasek and Theorell (1992) found that the greatest risk to physical and mental health from stress occurs when workers face high psychological workload demands or pressures combined with low control or decision latitude in meeting those demands. Yelin (1997) found that people who have discretion over their work activities are less likely to stop working when faced with the onset or exacerbation of a disability. However, the causal relationship in this finding is unclear. Workers in jobs with more discretion may have other characteristics that are related to their continued working. Further, changes that result in increased discretion, such as the flattening of organizational hierarchies and increase in team-based work, do not necessarily ameliorate stress or allow individuals to more effectively accommodate their limitations.

Task scope

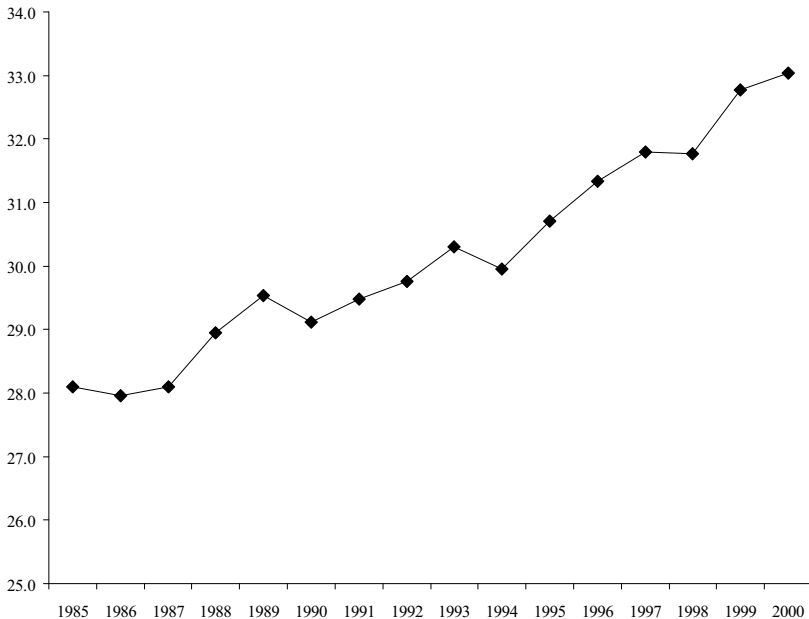
The skills required for a job are not necessarily limited to specific tasks, but might include the ability to operate effectively in a wide range of mental, interpersonal, and manipulative tasks across a range of situations. Although task scope is related to substantive complexity, it is distinguished by a type of flexibility that may pose particular obstacles for workers with disabilities.

Many jobs require a nonspecialized degree, such as a high school diploma or a bachelor's degree. Unlike specific vocational preparation, which teaches the worker a particular skill, a general education requirement is often used to ensure that the worker can perform a wider scope of work.¹³ Education serves as a screening device (i.e., someone with a college degree is more likely to be able to pick up new skills needed as the breadth of the job expands) as well as providing general skills needed to perform jobs that have a wide task scope. It is clear that educational attainment has become more important in the workforce. The share of hours worked by those without a high school diploma has been declining for the past two decades, from 23 percent for men in 1978 to

12 percent in 1997, and from 20 percent to 9 percent for women (U.S. Department of Labor 1999). The value of education is reflected in increases in educational attainment. Over the same period, the percentage of men aged 25–54 with less than a high school diploma has decreased from 22 percent to 14 percent; the same percentage for women declined from 25 percent to 12 percent.¹⁴ Based on changes in the distribution of jobs (ignoring changes in educational requirements within a job category), we find that jobs requiring a bachelor's degree or higher increased from 28 percent in 1983 to 33 percent in 2000 (Figure 4.7).

Increases in general degree requirements likely disadvantage workers with disabilities as a group, because of their relatively low levels of education. Statistics on the differences in educational attainment depend on how disability is defined, but are always large. For instance,

Figure 4.7 Percent of Jobs that Require Bachelor's Degree or Higher

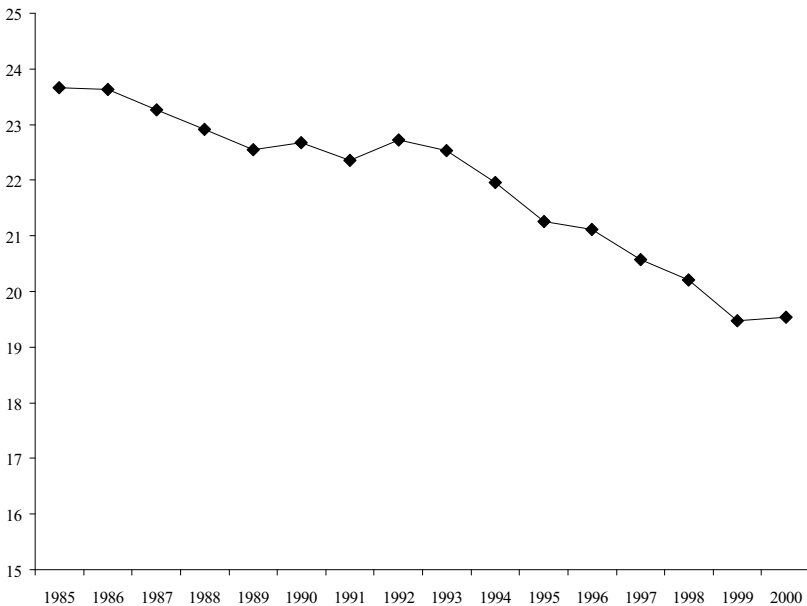


SOURCE: Authors' calculations based on 1991 *Dictionary of Occupational Titles* job characteristics merged with CPS March Supplement 1985–2000.

Kruse (1998) reports that 29 percent of working-aged people with disabilities have less than a high school degree, compared with 13 percent of those without a disability.

Task scope can also be measured by where along the career path a particular job falls. For example, some entry-level jobs are “starter jobs” that often lead to employment in better paying jobs. These are likely to encompass a larger task scope than “dead-end” jobs that are unlikely to lead to better employment. Based on the career paths of workers with low educational levels, Kusmin and Gibbs (2000) identify 27 dead-end jobs from the 482 occupations in the CPS. We find that, from 1985–2000, jobs that fall into this group declined from 24 percent to 20 percent (Figure 4.8).

Figure 4.8 Percent of Jobs that Are Dead-End



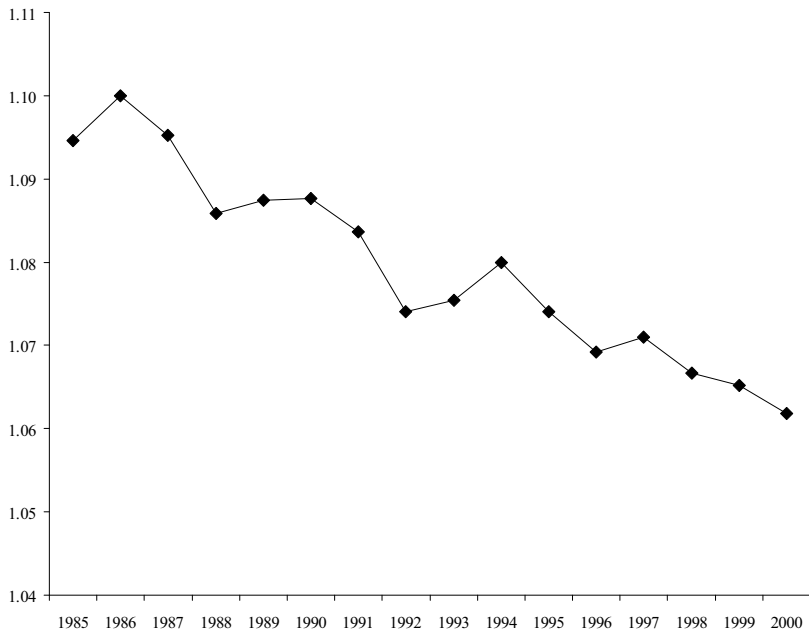
SOURCE: Authors’ calculations based on 1991 *Dictionary of Occupational Titles* job characteristics merged with CPS March Supplement 1985–2000.

Physical demands

As “shop floors” have become more automated, the need for strength and manual dexterity has declined. At the same time, shifts in occupation and industry employment decreased the number of people working on shop floors and increased the number of people in less physically demanding jobs (Howell and Wolff 1991).

Based on the CPS data, a changing mix of jobs accounted for a slow, steady decrease of the average “strength” needed for a job. As measured on a scale of 1–5, where 1 is sedentary and 5 is very heavy work, the average strength score declined from 1.10 to 1.06 between 1983 and 2000 (Figure 4.9). This trend reflects only changes in the distribution of occupations; it misses within-occupation changes, which might be substantial.¹⁵

Figure 4.9 Mean Value of Strength Score



SOURCE: Authors’ calculations based on 1991 *Dictionary of Occupational Titles* job characteristics merged with CPS March Supplement 1985–2000. The strength score is scaled 1–5 from sedentary to very heavy work.

If people with disabilities, on average, are at a disadvantage in performing jobs that require physical strength, one might expect relatively few workers with limitations to hold physically strenuous jobs. Findings from the literature are ambiguous, however, and our analysis of the CPS found the opposite relationship, especially in the first half of our sample period. There are at least three possible reasons for this counterintuitive result. First, those with disabilities who have mental limitations might have a comparative advantage in jobs that are physically strenuous. Second, workers in physically strenuous jobs might be more likely to report that a given physical condition is limiting than those in less physically strenuous jobs. Third, physically strenuous jobs are more likely to cause a disabling condition, and in many instances the condition will not result in immediate termination (Loprest, Rupp, and Sandell 1995).

These findings have no clear implications for the likely effect of decreases in strength requirements on employment outcomes for people with disabilities relative to others. They simply show how workers are sorted into jobs with varying strength requirements as the result of a complex, dynamic process. Studies that look at how the relationship between the physical demands of a job and the effect of disability onset on return-to-work might be more informative, but such studies are rare. One study did find that persons employed in white-collar jobs and jobs that were not physically demanding were more likely to return to work in the first three months after a lower extremity injury than others (MacKenzie et al. 1998). Results such as this would suggest that declines in the physical demands of work would reduce labor force exit after disability onset.

Like physical demands, adverse environmental conditions may affect the chance that a job is held by a worker with a disability in opposite ways. First, the difficult conditions make it less likely that workers with certain disabilities could perform the tasks, and second, the hazardous conditions might contribute to disabilities. The net result is that, although the DOT provides data on 14 adverse environmental conditions, none was consistently correlated with the job being filled by a worker with a disability. For this reason, we did not include any of them in our empirical analysis.

Terms of employment

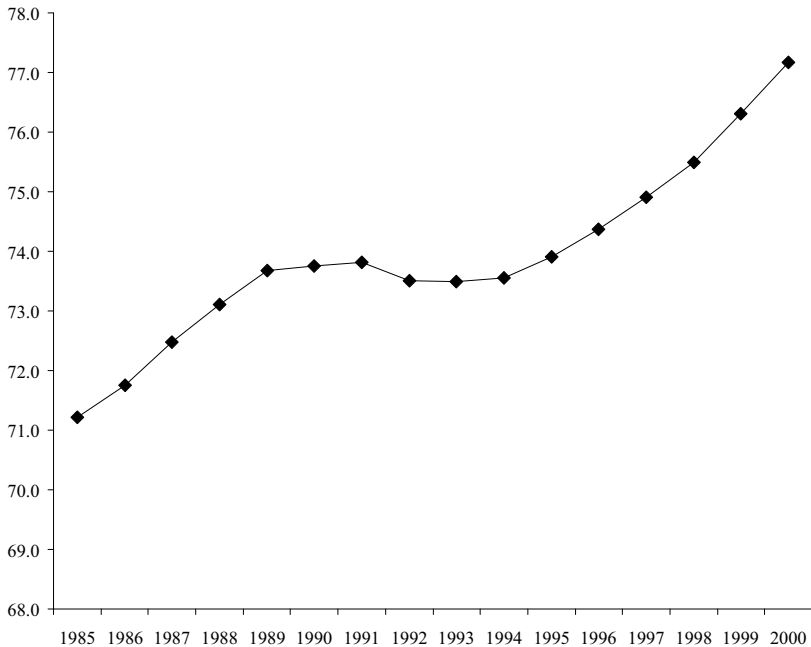
The terms of employment offered by an employer might affect the ability of a person with a disability to compete for a job. Here we consider the possible effects of several nonstandard work arrangements, as well as the role of employee benefits. We also consider employer size. Although employer size is not a term of employment per se, the terms of employment for one who works for a large corporation are likely to be much different from those encountered in a medium-sized or small business.

Nonstandard work arrangements. Conventional wisdom points to a dramatic increase in “nonstandard” work arrangements including part-time employment, working for temporary help agencies, contract or on-call work, day labor, and independent contracting. Although there have been increases in some types of alternative work arrangements, the suggestion that these changes have radically changed the workforce is exaggerated.

Overall, the percentage of the workforce that is working part-time has not grown appreciably since 1983, after growing substantially in the 1970s from 16 percent to 18 percent (U.S. Department of Labor 1999). The percentage of workers who are part-time varies considerably by sector. Although 40 percent of retail and 30 percent of service workers are part-time, only 11 percent of manufacturing employees are part-time. The conventional wisdom is fueled by the correct perception that the faster-growing sectors of the economy are employing more part-time workers (Fallick 1999). Also fueling the concern is a shift in part-time employment from voluntary to involuntary (three-quarters of the part-time workforce would rather be working full-time) and an increase in workers with multiple part-time jobs (Tilly 1991).

Based on analysis of our job characteristics database, the percentage of jobs that are both full-time and full-year (FTFY) has been increasing during most of the last two decades (Figure 4.10). From 1989 to 2000, the share increased from almost 73 percent to just over 77 percent. This finding seems inconsistent with the notion that nonstandard work is increasing, but a closer look reconciles the two.

Many types of jobs considered to be nonstandard are, in fact, FTFY jobs. One such position is temporary help. Employment in temporary help agencies has been growing at an average rate of 11 percent

Figure 4.10 Percent of Jobs that Are Full-Time/Full-Year

SOURCE: Authors' calculation of three-year moving average of full-time/full-year occupations based on CPS March Supplement 1983–2000. See note 2.

per year since 1972, although it still only accounts for about 3 percent of the labor force (Segal and Sullivan 1996). Employees of a temporary help agency are often employed FTFY.

Another type of nonstandard work is contract work. Although contract work may represent an important change for an organization, it may not represent a decline of standard work for employees. Consider, for example, a corporation that contracts out tasks previously performed by permanent employees. If the work goes to an organization with its own permanent employees, it may represent no net change in the percentage of standard jobs in the economy, even though it does represent a decline in job security of its current workers.

Flextime, compressed work weeks, and telecommuting are other forms of nonstandard work that include many FTFY positions. These

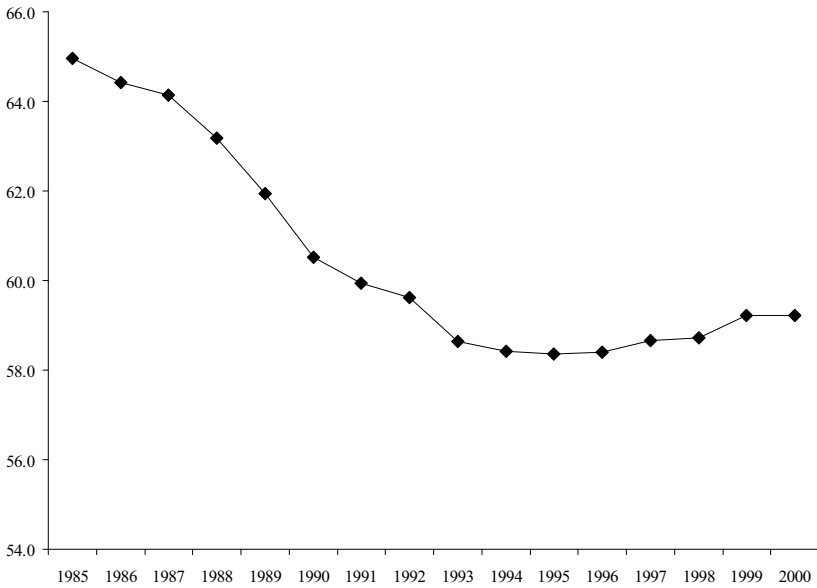
job features have increased dramatically in recent years. By 1997, 27 percent of full-time wage and salary workers had some flexibility in scheduling their work day, more than twice the rate in 1985. Needless to say, the level of flexibility offered to full-time workers varies dramatically by industry and occupation. For many occupations, flexibility is available only to part-time workers (Golden 2001).

Growth in nonstandard work relationships could be very important for people with disabilities, in a variety of ways. On the positive side, part-time arrangements might be favorable for those whose impairments make it difficult to work full-time. Such arrangements might also allow some to work while maintaining public income and medical benefits. Schedule flexibility can help those who have difficulty keeping a regular schedule because of an impairment or health condition. Job flexibility has been shown to be important in forestalling retirement (Hurd and McGarry 1993). Telecommuting would be especially advantageous for those facing difficult transportation challenges because of their impairment or where they happen to live.

Employment in nonstandard jobs is likely to be associated with lower compensation (wages and benefits) for people with given qualifications, including those with disabilities. Some features that might make these jobs attractive to people with disabilities might also impose costs on employers. Many people with disabilities might, however, find that the lower compensation is more than made up for by job features such as flextime, telecommuting, and less than full-time work.¹⁶

Benefits. Among the variety of benefits offered to different workers, health and disability insurance are the ones most likely to affect the employment of people with disabilities. As Hill, Livermore, and Houtenville discuss in Chapter 5, some workers with disabilities might choose to stay out of the labor force to obtain the insurance benefits that come with Social Security Disability Insurance (SSDI) and Supplemental Security Income (SSI), owing to problems with private health insurance.

Our analysis shows a decline from 1985 through 1993 of about 6 percentage points in workers who have employer-subsidized health insurance but after that, the percentage stabilized, increasing only slightly by 2000 (Figure 4.11). As Hill and colleagues (Chapter 5) discuss, the decline in coverage appears to be due more to a decline in

Figure 4.11 Percent of Jobs with Employer-Subsidized Health Insurance

SOURCE: Authors' calculations based on 1991 *Dictionary of Occupational Titles* job characteristics merged with CPS March Supplement 1985–2000.

employee take-up of employer-offered coverage than a decline in offered coverage, perhaps because of rapidly growing employee premiums and growth in coverage restrictions.

Another benefit of considerable relevance is disability insurance, which might affect the probability that a worker will remain on a job after the onset of a disability, in potentially conflicting ways. On the one hand, the income provided to a worker with a successful claim might encourage the worker to leave the labor force. On the other hand, disability managers affiliated with disability insurance programs often encourage and help potential claimants to go back to work, and encourage employers to make needed accommodations.

Long-term disability insurance, which generally replaces 60 percent of the worker's wage, is available to about 25 percent of employees.¹⁷ This benefit, like health insurance, varies dramatically by size of firm, union status, and wage.¹⁸ It is impossible to gauge the impact of

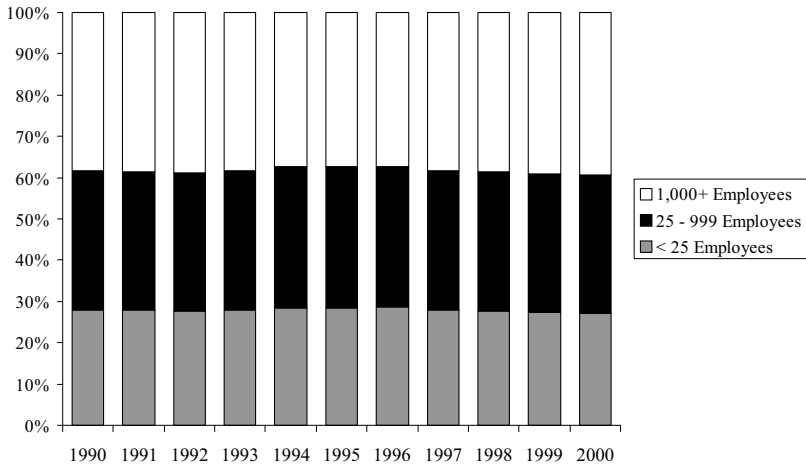
long-term disability insurance on the employment rate of workers with disabilities because there is a lack of information on whether there have been any significant changes in the number of workers covered.

Employer size. Firm size may influence the employment relationship through several avenues. First, the “traditional” lifetime commitment model, where the employer provides training, internal development, and job ladders, makes most sense in relatively large firms (more than 500 employees) (Cappelli 1999). Although large firms have most dramatically changed the employment relationship in the past decade, they continue to have lower turnover rates.

For people with disabilities, firm size has several other effects. First, large firms may enable workers who experience onset of a disability to remain with the company in a different position. A large firm is also more likely to offer a range of benefits, including health and disability insurance,¹⁹ and, as discussed above, these might affect the chance that a worker with a disability will continue working after onset.

In addition, if the enactment of the Americans with Disabilities Act (ADA) had a negative effect on the employment of people with disabilities, it should be most apparent in medium-sized firms (Acemoglu and Angrist 2000). Small firms (fewer than 25 employees) are exempt from the ADA, and large firms should find it less expensive to comply with ADA requirements.

The CPS did not ask workers about the size of their firm before 1988. Since then, there has been a slight growth in the percentage of workers employed in firms of 1,000 or more employees, and a slight decline in the percentage employed in firms with 25 or fewer employees (Figure 4.12). We found a negative, significant correlation between whether the job is at a firm with 1,000+ employees and whether the job is filled by a worker with a limitation in the 1988–1990 sample, but the correlation was positive and insignificant in the 1998–2000 sample. The correlation between whether a firm has 1–24 employees and whether a job is filled by a worker with a limitation is positive and at least marginally significant in the samples for both periods.

Figure 4.12 Employer Size

SOURCE: Authors' calculation of three-year moving average of employer size based on CPS March Supplement 1983–2000. See note 2.

Effect on the Employment Rate of People with Disabilities

The discussion above indicates that people with disabilities, on average, are better able to compete for jobs with certain static characteristics relative to others. Whether people with work limitations end up in jobs that have relevant characteristics depends on a complex “sorting” process, through which workers and jobs are matched—namely, the labor market. This includes what economists call internal labor markets (the process through which workers are assigned to jobs within firms) as well as the more commonly recognized external labor market, through which people move between employers. The observed result of the sorting process, how it has changed over time, and trends in mean job characteristics might provide clues about factors that are influencing trends in the employment of people with disabilities.

We use our database to examine the relationship between the percentage of workers with limitations and each of the 11 static job characteristics we selected, holding each of the other 10 characteristics constant. We use linear regression to go beyond the simple correlations reported earlier and determine what relationship remains after control-

ling for the other characteristics. We also take a closer look at the stability of the remaining relationship over the period from 1990 to 2000.

We estimated the relationship between the percentage of workers with limitations and job characteristics in every year for each year from 1990 through 2000.²⁰ Although all of the characteristics were correlated to the percentage of workers with limitations when considered individually, for several characteristics, the relationship became statistically insignificant after controlling for the other characteristics. We also found that some characteristics were statistically significant predictors of the percentage of workers with limitations in some years, but not in others. For some characteristics, there is intriguing evidence of a shift in the relationship.

As documented in the previous section, the means of several of the characteristics revealed substantial trends during the last two decades. For each characteristic, we use the results of the analysis described in the previous paragraph along with the trend in the mean characteristic to assess the extent to which the characteristic might have contributed to the decline in the percentage of all workers with limitations from 1990 through 2000. Mechanically, this analysis proceeds as follows. Say we find that the percentage of workers with limitations is higher by amount A (the “coefficient”) if the job has characteristic X than if it does not (holding other characteristics constant), and the percentage of jobs with characteristic X changes by P percentage points from 1990 to 2000. We infer that the change in the percentage of jobs with characteristic X might have changed the percentage of all workers with limitations by $A \times P$.

A key assumption in this analysis is that the observed relationship between characteristics and the percentage of workers with limitations in any given year is a causal one reflecting how an exogenous change in a job characteristic will affect the percentage of workers with limitations.²¹ As indicated above, however, the observed relationship is the outcome of a complex sorting process, and might not reflect a causal relationship. Hence, for each variable, we must consider whether the estimated effect for each variable (i.e., the coefficient) really represents an effect. The possibility also exists that the relationship between a characteristic and the percentage of workers with limitations changes over time (i.e., A is not constant). In that case, it is important to understand the reason for the change and its implication for the interpretation

of the findings. We discuss the results for individual characteristics below, in diminishing order of the approximate strength of the finding.

Employer-subsidized health insurance

The relationship between employer subsidized health insurance and the percentage of workers with limitations, holding other characteristics constant, was the most statistically significant of all the characteristics considered, over the entire period. The average estimate, over all years, implies that, holding other job characteristics constant, the percentage of workers with limitations in an occupation is almost five points higher if no workers in that occupation receive employer-subsidized insurance than if they all do.²² This is a very large difference, considering that the percentage of all workers with limitations was only 2.5 in 2000. Although there is some variability in the results from year to year, there is no apparent trend in the strength of the relationship.

Three hypotheses possibly explain this finding. First, it might be that employers who provide subsidized health insurance are less likely to employ people with disabilities because of their relatively high health care costs. Second, people with disabilities might be less likely to have the skills and productivity necessary to qualify for the types of high-paying jobs that typically include health insurance as part of compensation. Third, people with work limitations might be less willing than others to take the type of job that offers insurance, perhaps for health reasons (e.g., because they are unable to work as many hours, or as intensely, as the job requires) or because they do not want to lose eligibility for public income and health benefits. We have tried to limit the extent to which the latter two explanations could influence the finding by controlling for other characteristics, but those characteristics probably only partially capture the effects of these factors.

As discussed earlier, the percentage of workers who are covered by employer-subsidized health insurance has declined significantly. Our finding that employer-subsidized health insurance is negatively related to the percentage of workers with limitations would seem to imply that the decline in employer coverage has had a substantial, favorable impact on the overall percentage of workers with limitations. Mechanical application of the methodology described above leads to the conclusion that the decline in employer coverage, alone, increased the

percentage of workers with limitations by about 2 percent (compared with an actual decline of about 13 percent).

This conclusion might be correct if the main reason for the observed relationship between employer coverage and the percentage of workers with limitations is the relatively high health care costs of such workers. If an employer stops offering coverage, imposes restrictions on coverage, or requires larger employee premiums or co-payments, health care costs for workers with limitations become less of an issue for the employer.

If, instead, the primary reason for the negative relationship is that workers with limitations are less likely to have the skills and productivity necessary to obtain such jobs, or are less likely to want them for other reasons related to their condition, then the decline in employer coverage might have little effect. Instead, it might simply be that many good jobs are increasingly less likely to provide health insurance benefits that are attractive to workers with limitations because the employer's cost for such benefits has increased relative to the cost of other forms of compensation (e.g., wages and retirement benefits). Further, if individuals with limitations are unwilling to take jobs for health or public benefit reasons, the decline in employer coverage for some jobs is likely, if anything, to increase that reluctance.

Hence, although there is a strong negative relationship between employer-subsidized health insurance and the percentage of workers with limitations, it seems premature to conclude that the decline in employer-subsidized health insurance has had a favorable impact on job opportunities for people with disabilities. At the same time, it seems plausible that tightening of employer-subsidized benefits has reduced the cost to employers of hiring workers with disabilities who might require substantial health care relative to others. For further analysis of the relationship between employment of people with disabilities and the growth of health care costs, see Hill and colleagues (Chapter 5).

Educational and training requirements

Three of the included characteristics are measures of educational and training requirements. We expected each to have a negative relationship with the percentage of workers with limitations, but only two of the three did:

- The more *specific vocational preparation* a job requires, the lower the percentage of workers with limitations, after controlling for the other characteristics. The average estimate of 0.20 indicates that if the level of specific vocational preparation for a job increased from a short demonstration to more than 10 years (the maximum possible increase), the percentage of such jobs filled by a worker with a limitation would decline by 1.8 points.
- Jobs with low *GED language* requirements have a higher percentage of workers with limitations than others, after controlling for other characteristics. The relationship is statistically significant in most years. Although the magnitude of the estimated relationship varies substantially from year to year, there is no evidence of a trend in its strength. The average estimate, of 0.30, implies that for each additional level of competency (i.e., moving from an elementary level of competency successively to, middle, early high school, late high school, and college), the percentage of workers with limitations declines 0.3 percentage points.
- We did not find consistent evidence of a positive relationship between whether the job required a *bachelor's or higher degree* and the percentage of workers with limitations, after controlling for the other characteristics, although we did find positive significant relationships in 3 of the 11 years.

In the previous section, we presented evidence of positive trends in the education and training requirements for the average job, although the most notable trend was in degree requirements—the variable that has the weakest relationship with the percentage of workers with limitations. If we assume that the observed relationship between these characteristics and the percentage of workers with limitations reflects the effect of these requirements on employment of people with work limitations, then we infer that increases in mean requirements for these variables have reduced the percentage of all workers with limitations by about 1.5 percent from 1990 to 2000 (compared with the actual decline of about 13 percent).

Employer size

We included two employer size variables—an indicator for small firms (fewer than 25 employees) and one for large firms (1,000 or more

employees). The implicit comparison group is medium-sized firms (25–999 employees).²³ The estimated relationship between the percentage of workers with limitations and our employer size variables changed over the period from 1990 to 2000.

Before 1995, there was no statistically significant difference between the percentage of workers with limitations in large and medium firms, after controlling for other variables. From 1995 on, however, the percentage for large firms was significantly higher, holding the other characteristics constant. The average estimate for 1995 through 2000 indicates that the percentage of workers with limitations is about three points (0.03) higher if the job is in a large firm than if it is in a medium-sized firm, holding other job characteristics constant. The evidence also suggests that in the early 1990s, jobs in small firms were slightly less likely than those in medium-sized firms to be filled by a person with a work limitation, but slightly more likely in the late 1990s, holding other characteristics constant. The timing of the change in coefficients approximately coincides with the beginning of the sharp decline in the percentage of all workers with limitations.

In some ways, this finding is consistent with the hypotheses and evidence discussed by DeLeire (Chapter 7), concerning the potential effects of the ADA on employment of people with disabilities. The ADA does not apply to small employers, and medium firms are more likely than large firms to find that costs prohibit compliance. The theoretical expectation is that the ADA will reduce employment of people with disabilities in medium-sized firms relative to employment in small and large firms. Our finding for large firms relative to medium firms is particularly striking. Note, however, that the findings by themselves do not indicate whether the ADA had a positive or negative effect on employment of people with work limitations overall; they only suggest effects that vary by firm size in a manner that is consistent with theoretical predictions. Although they could be consistent with an overall negative impact of the ADA on the percentage of workers with limitations, they are equally consistent with a scenario under which the ADA increases the percentage of workers with limitations in firms of all sizes, but by more in small and large firms than in medium firms.²⁴ Note also that the change in the relationship appears to occur in 1995, five years after the ADA's passage and three years after initial implementation. Of course, it might have taken several years for any sub-

stantial effect to materialize, but much of the other evidence concerning the ADA finds effects that begin several years earlier.²⁵

As the distribution of jobs by employer size changed little during the last two decades, change in firm size itself cannot be a major source of change in employment of people with disabilities. It appears, instead, that factors that influence the employment of people with disabilities within firms of any given size are responsible for the trends, and the effects of at least some of these factors vary with the size of the employer.

Dead-end jobs

In 9 of the 11 years, we found that jobs classified as dead-end have a lower percentage of workers with limitations than others, holding other characteristics constant, but the relationship was only statistically significant in four of these years, and there is no apparent trend.

Strength

For 1990 and 1991, we found a strong, positive relationship between a job's strength requirement and the percentage of workers with limitations, holding other characteristics constant, but this relationship disappeared in later years. To assess whether the early relationship reflects the recession or some other temporary phenomenon, we replicated the analysis extending back to 1985, excluding the employer size variables, which were unavailable in earlier years. We found a positive relationship in each of the five additional years, although it was only significant in three.²⁶ From 1985 through 1991, a one-step increase in strength demand led to a 0.26 percentage point increase in the percentage of workers with limitations. We also found that simple correlations between other measures of physical job requirements and whether a job is filled by a worker with a limitation were significant in the early years of our data, but not in the later years.²⁷ What is notable is not that the percentage of jobs that require physical strength and dexterity has decreased (a well documented fact), but rather that this job characteristic exerts progressively less influence on whether a job is held by a worker with a disability. We have no solid explanation for the finding, but there are at least two possibilities. People in jobs that require strength might leave the jobs sooner after the

onset of a disability than they once did, or maybe highly physical jobs cause fewer or less severe disabilities than in previous years.

Other variables. After controlling for the other variables, we found no consistent, statistically significant relationship between each of the following characteristics and the percentage of workers with limitations:

- full-year/full-time;²⁸
- job requires the holder to direct, control or plan the activities of others; and
- job requires largely repetitive tasks.

Although each of these three characteristics has a significant simple correlation with whether a job is filled by a person with a work limitation, each relationship disappears after controlling for other factors. Thus, we do not find any link between changes in these job characteristics and trends in the employment of people with disabilities.²⁹

Combined effects of changes in static job characteristics

To summarize, the empirical analysis does not identify any single static job characteristic that could account for a large share of the decline in the percentage of workers with limitations. It does not, however, rule out the possibility that a wide variety of changes in job characteristics, each small, and some too small to measure, might account for the decline. To assess this possibility further, we conducted an analysis that separates the decline in the percentage of workers with limitations between two three-year periods a decade apart, 1988–1990 and 1998–2000,³⁰ into two components: 1) change owing to change in the distribution of occupations, holding the percentage of workers with limitations within each occupation constant (“composition effect”), and 2) change owing to within-occupation change in the percentage of workers with limitations. The composition effect indicates the maximum extent to which change in the mean characteristics of occupations owing to changes in the distribution of occupations could account for the decline in the percentage of workers with limitations. The within-occupation component captures all changes associated with changes in the percentage of workers with limitations within individual occupa-

tions, including changes that might stem from changes in the characteristics of individual occupations.³¹

The percentage of workers with limitations declines from 2.90 percent in 1988–1990 to 2.51 percent in 1998–2000 (Figure 4.1), a decline of 13.4 percent, or 0.39 percentage points. The decomposition attributes just 0.04 percentage points of the decline to the compositional effect, or just 10 percent of the total decline. The remainder is owing to within-occupation declines.

Within-occupation decline in the percentage of workers with limitations could stem from within-occupation changes in job characteristics. It seems unlikely that this effect would be substantial, however, unless there was also a substantial decline owing to change in the distribution of occupations. Another feature of the evidence that makes us skeptical about the possibility that within-occupation changes in job characteristics can explain much of the decline is that characteristics for which we can observe within-occupation changes (e.g., employer size, employer-subsidized health insurance, and full-time, full-year) have been changing slowly during the last two decades, while the decline in the percentage of workers with limitations occurred in the last one-third of that period. We have not found quantitative or qualitative evidence of a comparable pattern of change in any static characteristic.

THE DYNAMIC ASPECTS OF WORK

Job change of any type, and under any circumstances (voluntary or involuntary; same employer or new employer), likely disadvantages many workers with disabilities relative to workers without disabilities. Change can be difficult for anyone,³² but the process of identifying another appropriate job or occupation, retraining, applying for a new job, convincing a prospective employer that you are able to perform the needed tasks, getting the job, and adapting to the new job (including determining and obtaining needed accommodations) can all be more difficult because of a disability. Job change resulting from involuntary job loss is likely to be the most challenging type of change for any worker, and especially for a worker with a disability. Under this cir-

cumstance, it is likely that reemployment must be with a new employer, in a new industry, in a new occupation, or in a new area. Between 1983 and 1988, one in six displaced workers moved to another city or county to find work (Herz 1990). Finding suitable housing, arranging for transportation to work, and other aspects of moving generally require more effort for people with disabilities.

The dynamic nature of the labor market is also a significant challenge to the programs that provide support for people with disabilities, and has additional adverse consequences for the people they serve. The most obvious example is vocational rehabilitation, which must take into account how the labor market is changing and how the abilities of their clients affect their ever-changing opportunities. Unemployment insurance might provide an adequate safety net for workers without disabilities, but many with disabilities might find it inadequate and turn to the SSDI program for support, even though this program is intended to provide long-term assistance to those who cannot work and is ill-equipped to provide temporary support. Similar issues arise with health insurance. The ultimate result might be permanent labor force exit of many people with disabilities who really are capable of work (see Goodman and Waidmann, Chapter 10), as well as denial of benefits to some who are not, and prolonged hardship from joblessness for many others.

Evidence provided by Yelin (1992) illustrates the greater difficulty that workers with disabilities have adjusting to a changing labor market. He found that workers with disabilities experienced a disproportionate amount of displacement from declining sectors and a less than proportionate increase in expanding ones.

Of course, jobs have always had some level of insecurity, and presumably insecurity has always disadvantaged workers with disabilities relative to others. The difficult question to address is whether jobs became substantially less secure in the 1990s—sufficiently so to account for a substantial share of the decline in the employment rate for people with disabilities.

At least two reasons may explain why jobs might have become less secure. The first is increased competitiveness, owing to reduction in trade barriers, industry deregulation, and the Internet. The second is the more direct impact of information technology on how goods and services are produced, which has made some jobs obsolete even as it has

generated many new ones. Unfortunately, the evidence on the extent of decline in job security is poor. People who study large corporations tend to find revolutionary changes in the employment relationship, but labor economists who study the aggregate labor market argue that the change is modest, at best.

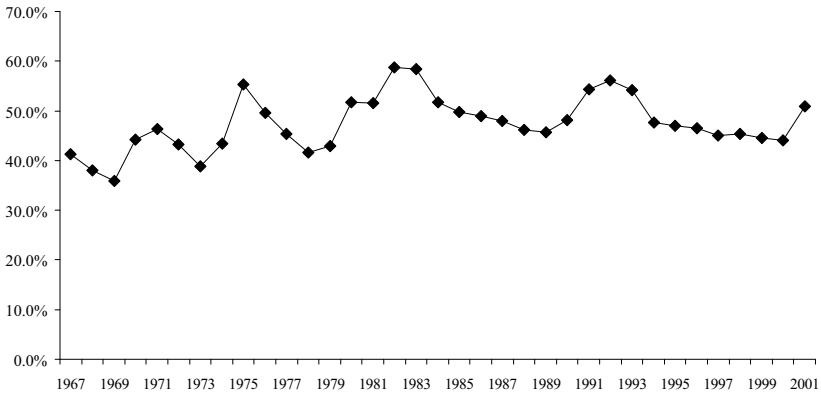
Ryan (1995) finds a general perception that the life-long job with a big company is a thing of the past, and that we should all expect to change jobs six times, and careers three times, over the course of our work life. Capelli (1999, pp. 2–3) writes, “If the traditional, lifetime employment relationship was like a marriage, then the new employment relationship is like a lifetime of divorces and remarriages.” He describes a sweeping change from corporations that provide a lifetime of job security, internal job development, training, job ladders, good benefits, and pensions in exchange for loyalty, hard work, and a stable workforce to a free agency workforce, where workers go to the highest bidder, and employers churn the workforce, downsizing, contracting, and outsourcing in an effort to gain a competitive edge.

A number of studies by economists find evidence of increased involuntary job loss offset by a decrease in voluntary resignations.³³ Official employment statistics show a substantial, positive, long-term trend in the percentage of unemployed persons who have experienced involuntary job loss, as can be seen by comparing figures from the strong economy of the late 1960s to the strong economy of the late 1980s (Figure 4.13). During the strong economy of the late 1990s, however, the percentage of unemployed workers who had experienced involuntary job loss was actually lower than in the late 1980s.

Another aspect of job security is job tenure. Unfortunately, survey data on tenure are known to be poor.³⁴ A number of studies conducted in the mid 1990s found little evidence of a decline in job tenure.

In summary, although the perception of a decline in job stability might have some basis in evidence over three and one-half decades, available evidence does not suggest a change in the last decade that could explain the employment rate decline for people with disabilities.

These statistics consider the entire labor force, and might hide trends that are more specific to people with disabilities. In fact, Farber (1995) reports that there is evidence that job tenure has declined for men with less than a high school degree, although this study does not extend to the period of most interest to us. It seems likely that increased

Figure 4.13 Involuntary Job Loss as a Percent of Total Unemployment

SOURCE: Council of Economic Advisors (2003).

international competition and changes caused by advances in information technology have reduced job security for those with fewer skills and less education, especially. Hence, it is possible that a decline in job security could help explain why the employment rate for people with disabilities who also have limited education has declined more sharply than for those with higher levels of education. It might also be, however, that the decline in job duration for this group reflects an increase in labor force exits for those who have disabilities. More research on this issue would be necessary to assess the direction of causality.

The statistics on job loss and job tenure do not necessarily reflect all labor force trends that might be reducing job security. Earlier, we discussed the rise in nonstandard work arrangements. Among others, these include contingent workers—workers who are brought in on a part-time or temporary basis when needed and are quickly let go when the need subsides. There are a variety of arrangements that enable firms to maintain an elastic workforce, including subcontracting or outsourcing parts of the business, hiring through a temporary employment agency, hiring on-call workers, or hiring workers as consultants. On the one hand, these arrangements seem to offer flexibility, but on the other hand, they offer limited security.

Contingent work was first identified as a phenomenon in 1985 (Hipple 2001). Unemployment statistics might not reflect a rise in contingent workers, who likely report themselves as employed. The same is true for job tenure statistics, because contingent workers might view themselves as working for a single employer over a long period of time. Unfortunately, no reliable data are available on contingent workers before 1995. The Bureau of Labor Statistics estimates that 4.9 percent of workers were contingent workers in 1995, by the agency's broadest definition, and that the figure declined to 4.3 percent by 1999. Although it could be that contingent work is especially problematic for workers with disabilities, the phenomenon does not seem large enough to explain the decline in the employment rate, especially given that the phenomenon was already large enough to be widely recognized by the late 1980s.

In summary, there are many reasons to think that involuntary job loss disadvantages workers with disabilities relative to otherwise comparable workers, and some evidence also suggests a long-term decline in job security. What is missing is evidence of a sudden, widespread decline in job security during the 1990s. It seems unlikely, therefore, that a decline in job security could explain a significant share of the decline in the employment rate. If declines in job security played any role in the decline of the employment rate, it most likely was for those with low levels of education only.

CONCLUSION

The world of work is always changing, and there is no doubt that many changes affect the ability of people with disabilities to compete in the labor market. Can recent changes, however, explain the decline in the percentage of workers with limitations that occurred in the 1990s? Although the evidence is imperfect, we conclude that changes in the nature of work and the labor market cannot account for much of the decline. The analysis shows that any substantial effects owing to changes in job characteristics must be from changes within occupations, not changes in the distribution of occupations. We doubt that within-occupation change in characteristics could explain much of the

decline, either, because trends in the static characteristics we observe within occupations are gradual and long-term. In contrast, the percentage of workers with limitations displayed no trend from the mid 1980s through the mid 1990s, then began a sharp decline.

The one trend in the static characteristic of jobs for which there is reasonably convincing evidence of a depressing effect on employment for people with disabilities is growth in skill requirements, but it appears that this is a slow, long-term trend, rather than a sudden, recent change.

The dynamic characteristics of work are also changing. Most important, a decline in job security could potentially contribute to the employment rate decline because workers with disabilities likely find it significantly more challenging to change jobs than workers without disabilities who are otherwise similar. Although it is a common perception that job security has declined markedly in recent years, data on historical trends are limited. There is a long-term trend toward more involuntary separations, but this trend is strongest before the 1990s. No clear evidence indicates a decline in job tenure, either, although some evidence suggests a decline for workers with limited education. No departure from long-term trends is apparent that could explain why the percentage of workers with limitations was quite stable before the early 1990s, then started to decline fairly sharply.

Overall, available evidence does not implicate changes in the nature of work or the labor market as the cause of the decline in the percentage of workers with limitations or, therefore, the decline in the employment rate for people with disabilities. The possibility remains, of course, that this overlooks some very substantial effects for subgroups of people with disabilities. We would expect, however, that changes in job characteristics would affect employment of subgroups gradually and over a long period, rather than precipitously.

Notes

1. The measure of work limitation we use is the same CPS measure used by Burkhauser, Houtenville, and Wittenburg in Chapter 2, as well as by many other researchers. As others have pointed out (see, especially, Hale 2001), this measure is highly imperfect. We will not address these issues here, except to say that we

think the CPS measure is useful for measuring long-term trends in the employment of people with disabilities, based on the evidence presented in Chapter 2 and in Burkhauser et al. (2001).

2. Visual inspection of the figure indicates the decline started in 1996, but recall that the series is a three-year moving average. The 1996 figure represents the means of the three values for 1994 through 1996.
3. In fact, today we would be more likely to call it a motionless digital image rather than a snapshot.
4. While conceptually different, the static and dynamic aspects of work are related because the activities that workers participate in are influenced by the dynamics of work. For instance, in a rapidly changing work environment, communication is likely to be a more frequent and important activity than it would be in a slowly changing one. Hence, changes in the dynamic aspects of work can also affect the ability of workers to compete through their impact on static aspects of work. But these changes might or might not be advantageous for a person with a disability, depending on the person's characteristics.
5. The categories are based on work by Spenner (1995), Howell and Wolff (1991), Commission on Behavioral and Social Sciences (1999), and our own analysis of correlations between job characteristics and employment of workers with disabilities.
6. See Deardorff (1998) for a review of the literature.
7. See Spenner (1995) for a review of the literature.
8. This is the standard economic argument of substitutes and complements.
9. The levels correspond to the curricula taught in primary and secondary schools and colleges. A code of 1 indicates that the individual needs the language competency taught in elementary school; 5 indicates a college level of competency is needed.
10. See Commission on Behavioral and Social Sciences (1999) for a review of the literature.
11. For example, the scripted, closely monitored activities of telephone operators.
12. See Commission on Behavioral and Social Sciences (1999) for a review of the literature.
13. There are several studies that show that more educated workers are better able to adapt to technological change (see Spenner 1995 for a review).
14. Computed from Census Historical Table A-1, "Years of School Completed by People 25 Years Old and Over, by Age and Sex: Selected Years 1940 to 2000." Available at: <http://www.census.gov/population/socdemo/education/tableA-1.txt>. (Accessed: July 3, 2002.)
15. The Social Security Administration uses the same strength score in the disability determination process for the Social Security Disability Insurance and Supplemental Security Income programs.
16. Loss of job security owing to some nonstandard work arrangements (e.g., temporary work or contract work) might be especially problematic for people with disabilities. See the discussion on the dynamics of the labor market.

17. Bureau of Labor Statistics, Employee Benefits Survey. Available at <:http://www.bls.gov/data/home.htm >. (Accessed: June 27, 2002.)
18. Short-term disability insurance is available to 36 percent of workers but is less likely to have an impact on a worker's permanent withdrawal from the labor force.
19. In firms with more than 100 employees, 65 percent had employer-sponsored health insurance and 36 percent had long-term disability insurance compared with 36 percent and 17 percent, respectively, in firms with 1–99 employees (Disability insurance statistics: U.S. Department of Labor 1999a; Health insurance statistics: U.S. Census Bureau 2002, Own employment coverage, 1998).
20. 1990 is the first year because the CPS did not collect information on firm size before 1988 and because we found it necessary for sample size reasons to use three-year moving averages for some characteristics. We conducted additional analysis using all predictor variables other than firm size for 1985 through 2000.
21. Those trained in econometrics and statistics recognize that we are using relationships estimated from cross-section samples to interpret time-series changes. The problem we face is that the cross-section relationships and the time-series relationships might be quite different.
22. The data do not allow us to distinguish between workers who do not have the option of buying health insurance that is subsidized by the employer from those who have the option but do not purchase it. Our measure of health insurance for each occupation is based on reported enrollment in employer plans for all CPS respondents during the last three years who are in that occupation and who do not report a work limitation.
23. Preliminary analysis revealed no significant distinction in employment of people with work limitations between employers of varying sizes within the intermediate category.
24. Additional assumptions are needed to make inferences about the total effect on the percentage of all workers with limitations. To illustrate, if we assume that the ADA is the only factor that has varying effects on the percentage of workers with limitations by firm size (holding other characteristics constant), that the ADA had no effect in small firms, and that the changes in the average coefficients for the firm size variables from before 1996 to 1996 and later reflect the effects of such factors, then we infer that such factors *increased* the percentage of workers with limitations from 1990 to 2000, by about three-tenths of a point (0.003). See Appendix 4A for details on this calculation.
25. See DeLeire (Chapter 7), Kruse and Schur (Chapter 8), and Blanck, Schwochau, and Song (Chapter 9).
26. To confirm that the earlier results were not owing to omission of the employer size variables, we repeated the analysis for 1990 and later years without the employer size variables.
27. Including the following physical demands: stooping, reaching, talking, hearing, near acuity, field of vision, and mobility.

28. In an earlier version of this chapter, we reported significant results for full-year full-time. This result disappeared when we added the firm-size variables to the analysis.
29. Although the coefficient for the repetitive task variable is not significant in most years, we did find that the change in the coefficient from 1990 to 2000 was statistically significant, and positive. Thus, there is some indication that the relationship between repetitive tasks and whether a job is filled by a person with a limitation, holding other characteristics constant, has gone from a weak negative one to a weak positive one.
30. We pooled three years of data for each period to increase samples sizes for individual occupations.
31. The methodology is the same as that used by Houtenville and Daly (Chapter 3). Our CPS samples include observations for 440 distinct occupations. Of these, four had no observations in the first of the two periods, and nine had none in the second. For this analysis we combined each of these 13 occupations with similar occupations, to reduce the total number to 427. Because the number of observations for each occupation is small, we cannot produce reliable statistics on the change in the percentage of workers with limitations within each occupation. The two terms in our decomposition are, however, estimated quite precisely.
32. For example, although 75 percent of long-tenured workers who lost full-time wage and salary jobs in 1991 or 1992 were reemployed by February 1994, 8 percent were in part-time jobs, 8 percent were self-employed, 28 percent were in full-time jobs with lower earnings, and 32 percent were employed in full-time jobs with the same or higher earnings (Gardner 1995).
33. See Commission on Behavioral and Social Sciences (1999) for review of the evidence.
34. The discussion in this paragraph is based on Nardone, Veum, and Yates (1997).

Appendix 4A

Data and Methodology

DATA

The data we use for the analyses described in this chapter are files that have been constructed by merging the March Supplement of the Current Population Survey (CPS) data to several sources of information on job requirements, namely:

- 1991 *Dictionary of Occupational Titles* (DOT91);
- Department of Labor, Bureau of Labor Statistics (BLS) education and training categories; and
- Job mobility classifications developed by Kusmin and Gibbs (2000).

The CPS is a monthly survey of approximately 50,000 people that provides a range of data on employment, including occupation, hours worked, earnings, size of employer, and so forth. The March Supplement provides data on whether the respondent has a disability that limits the type or amount of work he or she can do, as well as health insurance status.

Because the CPS provides data on occupations for respondents who report that they are in the labor force, we were able to match the occupation with job characteristics from the three other sources.¹ Additional job characteristics were computed using data from the CPS.² We matched job characteristics to an average of 47,247 respondents who were assigned occupation codes in each of the years 1983–2000.

Rather than using the standard approach of viewing each observation as a person, we view each observation of an employed person in the CPS as an observation of a job. Because the survey is designed as a nationally representative sample of the population, it also provides a nationally representative sample of jobs held.³ For each year from 1983 to 1999, we have created a large, nationally representative database of observations on jobs and job requirements.

One important limitation of this approach is that the job requirement measures from non-CPS sources do not capture any within-occupation changes in requirements during the period. This is a significant weakness of the data because we assume there have been significant changes in requirements within occupations during the 18 years spanned by the data. As a result, changes in mean occupational requirements during the period reflect only changes owing to changes in the distribution of occupations, and miss changes owing to within-occupation changes in job requirements.

Sources of Data on Job Characteristics

We developed job characteristics variables based on data from the DOT91, BLS education groups, Kusmin and Gibbs mobility groups, and the CPS. DOT91 has been used for many years by the Social Security Administration in

assessing the residual functional capacity of applicants to its disability programs. It is also used by vocational counselors and others to help counselors guide clients to appropriate occupations.⁴ The job requirements in DOT91 fall into six categories: 1) relationship to data, people, and things; 2) general education and training; 3) general aptitude; 4) temperaments; 5) physical demands; and 6) environmental conditions (see Table 4A.1).

The BLS Office of Employment Projections classifies occupations into one of 11 categories based on an analysis of education or on-the-job training needed to become fully qualified for the job.⁵ BLS uses the classifications for a variety of statistical purposes.

Table 4A.1 Job Requirements in the 1991 *Dictionary of Occupational Titles*

Data/people/things			
DATA	Synthesizing, coordinating, analyzing, compiling, computing, copying, comparing		
PEOPLE	Mentoring, negotiating, instructing, supervising, diverting, persuading, speaking-signaling, serving, taking instruction		
THINGS	Setting up, precision working, operating-controlling, driving-operating, manipulating, tending, feeding-offbearing, handling		
Education and training			
GEDR	General educational development reasoning score		
GEDM	General educational development math score		
GEDL	General educational development language score		
SVP	Specific vocational preparation: length of time needed in various vocational activities		
Aptitudes			
APTITUDG	General learning ability	APTITUDK	Motor coordination
APTITUDV	Verbal	APTITUDF	Finger dexterity
APTITUDN	Numerical	APTITUDM	Manual dexterity
APTITUDS	Spatial	APTITUDE	Eye-hand-foot coordination
APTITUDP	Form Perception	APTITUDC	Color discrimination
APTITUDQ	Clerical		
Temperaments			
TEMPA	Working alone or apart in physical isolation from others	TEMPR	Performing repetitive and/or continuous short-cycle work
TEMPD	Directing, controlling, and/ or planning activities of others	TEMPS	Performing effectively under stress

TEMPE	Expressing personal feelings	TEMPT	Attaining precise set limits, tolerances, and standards
TEMPI	Influencing people in their opinions, attitudes and judgments	TEMPU	Working under specific instructions
TEMPJ	Making judgments and decisions	TEMPV	Performing a variety of duties
TEMPP	Dealing with people		
Physical demands			
STRENGTH	Strength score: sedentary, light work, medium work, heavy work, very heavy work		
PHYDMD02	Climbing	PHYDMD12	Talking
PHYDMD03	Balancing	PHYDMD13	Hearing
PHYDMD04	Stooping	PHYDMD14	Tasting/smelling
PHYDMD05	Kneeling	PHYDMD15	Near acuity
PHYDMD06	Crouching	PHYDMD16	Far acuity
PHYDMD07	Crawling	PHYDMD17	Depth perception
PHYDMD08	Reaching	PHYDMD18	Accommodation
PHYDMD09	Handling	PHYDMD19	Color vision
PHYDMD10	Fingering	PHYDMD20	Field of vision
PHYDMD11	Feeling		
Environmental conditions			
ENVCON01	Exposure to weather	ENVCON08	Proximity to moving mechanical parts
ENVCON02	Extreme cold	ENVCON09	Exposure to electrical shock
ENVCON03	Extreme heat	ENVCON10	Working in high exposed places
ENVCON04	Wet and/or humid	ENVCON11	Exposure to radiant energy
ENVCON05	Noise	ENVCON12	Working with explosives
ENVCON06	Vibration	ENVCON13	Exposure to toxic or caustic chemicals
ENVCON07	Atmospheric conditions	ENVCON14	Other hazards

In a study of occupational opportunities for less-educated workers, Kusmin and Gibbs (2000) divided the CPS occupations into starter, dead-end, goal, other low-mobility occupations, and other high-mobility occupations. Goal jobs are defined as having wages in the top one-third of jobs that are available to people with a high school education or less. They defined *starter* and *dead-end* jobs based on the probability that the worker moved to a goal job, using data from the October 1996 Occupational Mobility Supplement to the CPS. Dead-end jobs have average or below-average wages and near-average or below-average prospects for moving into a better paying job, while starter jobs

are defined by a higher than average probability that the worker moved into a goal job. Other low-mobility and high-mobility occupations are defined as such because of the inaccuracy of estimates based on small numbers of low-educated workers in the occupation.

The CPS provides data on health insurance status, hours worked (full-time or part-time, full-year or part-year), number of employees in company (fewer than 25, 25–999, more than 1,000), sex, age, and union status. Because we wanted to assign a value to these variables based on the norm for the occupation, rather than the actual job for the individual, we pooled for each year the current and two prior year samples and computed the mean value of the variable for each occupation, based on workers without limitations only, and assigned that value to each occurrence of the occupation in the current year. Thus, the value of this characteristic that is attached to a record is the moving average for that occupation among sampled workers without disabilities in that occupation during the last three years.

Selection of Analysis Variables

Because of the large number of job characteristics in our database, and the likelihood that many were highly correlated with one another, we developed a systematic method for selecting a much smaller number for the analysis. As a first step in the process, we pooled the data into three time periods (1983–1985, 1988–1990, and 1998–2000) and examined the simple correlations between the characteristics and the limitation. We found that 26 characteristics were significantly correlated with the work limitation variable in all three of the time periods, and an additional 30 were significantly correlated in two of the time periods. Second, focusing on characteristics that had significant correlations in at least two time periods, we looked for job characteristics that were conceptually different from one another to minimize the correlation between the selected characteristics. Third, we looked for job characteristics that have changed over time.

Table 4A.2 describes the variables used in the final analyses presented in this chapter.

METHODOLOGY

Approach

The first step in the analysis is to examine the relationship between job requirements and whether the job is filled by a person with a “work limitation.” Work limitation is the measure of work disability that the CPS has used consistently throughout this period, and is defined as a health problem or disability that prevents the respondent from working or that limits the kind or amount of

Table 4A.2 Job Characteristics Used in the Analysis

Name	Description	Source	Values
GED: Language	GED, language score	DOT91	1–5 corresponding to the curricula taught in primary and secondary schools and colleges. 1 indicates the level of competency normally taught in elementary school; 5 indicates a required college-level competency.
DIRECT	Directing, controlling, or planning the activities of others	DOT91	1 if skill is required; 0 otherwise.
SVP	Specific vocational preparation	DOT91	1: short demonstration 2: up to 1 month 3: 1–3 months 4: 3–6 months 5: 6 months to one year 6: 1–2 years 7: 2–4 years 8: 4–10 years 9: 10+ years
REPEAT	Performing repetitive or continuous short-cycle work	DOT 91	1 if skill is required; 0 otherwise.
STRENGTH	Strength score	DOT91	1: sedentary 2: light work 3: medium work 4: heavy work 5: very heavy work
BA-Plus	Job requires bachelor’s degree or higher	BLS	1 if bachelor’s degree required; 0 otherwise.

(continued)

Table 4A.2 (continued)

Name	Description	Source	Values
Dead-end	Job is unlikely to lead to better employment	Kusmin & Gibbs (2000)	1 if job is dead-end; 0 otherwise.
FTFY	Full-time/full-year	CPS	1 if job is full-time/full year.
Health Ins	Employer-subsidized health insurance	CPS	1 if employer offers subsidized health insurance, otherwise 0.
Small employer	Employer size: < 25 employees	CPS	1 if employer size is < 25; 0 otherwise.
Large employer	Employer size: > 1,000 employees	CPS	1 if employer size is > 1,000; 0 otherwise.

work he or she can do. For each year, we estimate a multiple regression model for work limitation, including selected job requirements and other job descriptors as explanatory variables (Table 4A.3).⁶

Analysis of Trends

The next step uses the regression results to examine the extent to which trends in the proportion of workers with limitations can be accounted for by changes in the coefficients from the regression and changes in the means of the occupational characteristics. The analysis is based on the following decomposition identity

$$(1) \quad y_1 - y_0 = a_1 - a_0 + \sum_k (a_{k1} - a_{k0})(x_{k0} + x_{k1})/2 + \sum_k (x_{k1} - x_{k0})(a_{k0} + a_{k1})/2$$

where: 0 and 1 are used to index two comparison years; y_j is the proportion of workers with limitations in year j ; x_{kj} is the mean of characteristic k in year j ; a_j is the intercept in year j ; and a_{kj} is the regression coefficient of characteristic k in year j . The second term on the right-hand side is the difference owing to differences in the estimated coefficients, and the third term is the change owing to differences in the means.

It is important to recognize that the decomposition identity is just an identity. We cannot interpret the various components of change on the right-hand-side of Equation 1 as the causes of the change in y . Hence, in the text, we focus on whether the estimated coefficients can be interpreted in a causal fashion; examination of coefficients that change significantly over the period considered ($a_{k1} - a_{k0}$), and, for coefficients that are statistically significant and do not change significantly, the extent to which the trend in the variable's mean can account for the change in the proportion with limitations: $[(x_{k1} - x_{k0})(a_{k0} + a_{k1})/2]$.

In Table 4A.4, we show the estimated components of the change in the proportion of workers with limitations from 1990 to 2000. The estimates are based on the regression coefficients for those two years, as reported in Table 4A.3. In general, the discussion in the text is restricted to coefficient changes that were statistically significant. In assessing the significance of changes in coefficients, however, we also considered whether the change from 1990 to 2000 was consistent with a trend for the entire period, rather than just the result of random annual variability. For some coefficients, annual variability is quite high, and changes in coefficients from 1990 to 2000 that appear to be large are within the range of that variation. There is much less annual variability in the means of the characteristics, as evidenced from the graphics that appear in the text. Changes from 1990 to 2000 are all statistically significant, even though some are small from a substantive perspective. This is because sample sizes are large, on the order of 50,000 observations on jobs in each year.

Table 4A.3 Regression Coefficients, 1990–2000, Dependent Variable: Presence of a Work Limitation

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Intercept	0.076***	0.060***	0.080***	0.086***	0.086***	0.061***	0.076***	0.082***	0.077***	0.044***	0.067***
FTFY	-0.001	0.002	0.013	0.004	0.006	0.018*	-0.025**	0.003	-0.010	-0.013	-0.009
GED- language	-0.003**	0.001	-0.006***	-0.003**	-0.001	-0.002	-0.005***	-0.001	-0.004**	-0.002	-0.003*
SVP	-0.003***	-0.002*	-0.002	-0.002	-0.003***	-0.002**	-0.003**	-0.004***	-0.002	-0.003***	-0.001
Health ins.	-0.035***	-0.045***	-0.044***	-0.047***	-0.065***	-0.060***	-0.018	-0.052***	-0.054***	-0.025*	-0.057***
BA-plus	0.005*	-0.003	0.003	0.000	0.003	-0.004	-0.001	0.001	0.006***	0.004*	0.001
Dead-end	-0.003	-0.006***	-0.008***	-0.007***	-0.002	0.000	-0.005**	-0.003	0.003	0.002	-0.001
Direct	0.005*	-0.001	0.000	-0.001	-0.001	0.000	0.005*	0.001	0.004	-0.001	0.004*
Repeat	-0.005	0.004	-0.003	0.001	-0.001	0.003	-0.002	-0.001	0.004	0.000	0.010**
Strength	0.004***	0.004***	0.002	0.000	0.001	0.000	-0.002	-0.001	-0.001	0.001	0.000
Small emp.	-0.007	-0.009	-0.021**	-0.026**	-0.024**	-0.005	0.019*	-0.014	-0.008	0.027***	-0.004
Large emp.	0.004	0.004	-0.005	-0.007	0.006	0.028***	0.031***	0.013	0.022**	0.049***	0.033***

* $p \leq 0.10$; ** $p \leq 0.05$; *** $p \leq 0.01$.

Table 4A.4 Estimated Components of Change in the Proportion of Workers with Limitations, 1990–2000

Variable	Change in		Change accounted for by change in ^a	
	Coefficient	Mean	Coefficient	Characteristic
% limited	–	–0.389	–	–
Intercept	–0.0086	–	–0.86	
FTFY	–0.0080	0.0341*	–0.60	–0.02
GED-language	0.0004	0.0866*	0.12	–0.03
SVP	0.0023	0.1244*	1.26	–0.03
Health ins.	–0.0224	–0.0131*	–1.34	0.06
BA-plus	–0.0033	0.0392*	–0.10	0.01
Dead-end	0.0019	–0.0314*	0.04	0.01
Direct	–0.0004	0.0372*	–0.01	0.02
Repeat	0.0145*	–0.0169*	0.29	0.00
Strength	–0.0039*	–0.0257*	–0.42	0.00
Small employer	0.0026	–0.0063*	0.07	0.00
Large employer	0.0293*	0.0101*	1.14	0.02
Total			–0.42	0.03

^a Based on decomposition analysis of CPS. See equation 1.

*Statistically significant change.

Appendix Notes

1. Merging the CPS to the DOT was a complicated task. Census uses 535 unique occupations in the more recent CPS files (530 prior to 1992) compared with the DOT, which uses 12,741 codes. The number of DOT91 codes per Census code varies substantially across occupations. For instance, 72 of the Cen90 codes (the codes used by Census from 1992 on) had unique DOT91 matches, while three Cen90 codes were each matched to more than 500 DOT91 codes. To produce job requirements for each Census code, we computed the mean of the job requirements over all corresponding DOT91 codes. We have not conducted a full analysis of how much detail on job requirements is obscured by this method. It appears from inspection that variation in job requirements within DOT91 codes corresponding to a common Census code is small relative to total variation in job requirements. Nonetheless, we expect that the aggregation of job requirements in

- this manner is likely, if anything, to obscure the relationship between job requirements and work limitations.
2. Full-time/full-year, employer-paid health insurance, and firm size were computed by pooling years and computing the mean value of the variable for each occupation, based on workers without limitations only, and assigning that value to each occurrence of the occupation. For each year, we pooled data from the current year and the previous two years to compute these means. Thus, the value of this characteristic that is attached to a record is not the actual characteristic of that worker's job, but the mean for that occupation among sampled workers without disabilities in that occupation over the last three years.
 3. We apply the population weights to get a representative sample of jobs.
 4. The Department of Labor has recently replaced the DOT with a new system, O*NET, which provides data on a wider array of job characteristics. The DOT has some significant limitations. For example, its job characteristics are not consistently updated, and it differentiates between blue-collar jobs more accurately than white-collar. Nevertheless, the DOT is more relevant for the time period of interest to this study.
 5. The 11 categories are 1) first professional degree, 2) doctoral degree, 3) master's degree, 4) work experience plus bachelor's or higher degree, 5) bachelor's degree, 6) associate's degree, 7) postsecondary vocational training, 8) work experience in related occupation, 9) long-term on-the-job training, 10) moderate-term on-the-job training, and 11) short-term on-the-job training. Postsecondary awards, if generally needed for entry into the occupation, take precedence over work-related training.
 6. The table is based on the analysis of the period from 1990 through 2000. We have estimated other models using data for 1985 through 1989. We restrict our attention to the years indicated because the firm-size variables could not be constructed for earlier years. Earlier year models without firm-size variables are generally consistent with the later models, except that the full-year/full-time variable has a larger coefficient and is more significant.

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The Decline in Employment of People with Disabilities

A Policy Puzzle

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Editors

2003

W.E. Upjohn Institute for Employment Research
Kalamazoo, Michigan

Library of Congress Cataloging-in-Publication Data

The decline in employment of people with disabilities : a policy puzzle
/ David C. Stapleton and Richard V. Burkhauser, editors.

p. cm.

Includes bibliographical references and index.

ISBN 0-88099-259-X (pbk. : alk. paper) — ISBN 0-88099-260-3
(hardcover : alk. paper)

1. People with disabilities—Employment—United States. 2. People
with disabilities—Employment—United States—Statistics. 3. People
with disabilities—Employment—Government policy—United States. I.
Stapleton, David C. II. Burkhauser, Richard V.

HD7256.U5D413 2003

331.5'9'0973—dc22

2003015636

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Kalamazoo, Michigan 49007-4686

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the sole responsibility of the authors. They do not necessarily represent positions of
the W.E. Upjohn Institute for Employment Research.

Cover design by Alcorn Publication Design

Index prepared by Nancy Humphreys.

Printed in the United States of America.

Printed on recycled paper.