Medical and retirement plan coverage: exploring the decline in recent years

*The percent of workers with employer-provided
medical care and retirement benefits plans
declined over the past decade;
a variety of potential explanations are explored*

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Between 1992–93 and 2003, the percentage of private sector workers participating in employer-provided medical care plans steadily declined. Medical care covered 63 percent of workers in 1992–93, compared with 45 percent in 2003.[1] There were less dramatic declines in retirement plan coverage; such plans covered 53 percent of workers in 1992–93, compared with 49 percent in 2003. These declines may be the result of shifts in the composition of the labor force, changes in employer decisions to offer coverage or employee decisions to choose coverage, or some combination of these and other factors. Using data from the Bureau of Labor Statistics National Compensation Survey, this analysis begins to quantify how some of these factors affect the overall decline in benefits coverage. This is just a first step, however; further analysis planned by BLS is identified at the end of this article. (See exhibit 1 for a discussion of benefit measurement issues.)

Medical care coverage declined for various populations within private industry. Among full-time workers, there was a 17-percentage point decline in medical care coverage over the decade, from 73 percent in 1993–94 to 56 percent in 2003. Part-time workers rarely have medical care coverage, thus there was little change in the percent of part-time workers covered. (See table 1.)

While overall retirement plan coverage declined only slightly over the decade, there was a continuation of the widely reported shift from defined benefit to defined contribution plans.[2] The percent of workers covered by defined ben-efit plans shows a clear decline—coverage among private industry workers declined by more than one-third over the decade. While such plans are more prevalent among larger employers, coverage has declined in both larger and smaller establishments. At the same time, there have been increases in defined contribution coverage. The net result has been a slight decline in the percent of workers with any retirement coverage as well as a slight decline in those covered by both a defined benefit and a defined contribution plan. The introduction of 401(k) plans in the 1980s led to a period of dual defined benefit and defined contribution plan coverage for many employees.[3] The decline in defined benefit coverage is having the effect of slowly eliminating the occurrence of dual coverage.

Much has been written on trends in employee benefit coverage, and on the data sources that are available to track these trends. Diane Herz, Joseph Meisenheimer, and Harriet Weinstein discuss the two basic sources of data used to measure benefits coverage—data from households and data from employers.[4] Data from households have the advantage of providing good detail on demographics, family income (beyond that from a single employer), and alternative sources of benefit coverage (such as spouse coverage for medical care). Data from employers provide more precise information on the type of plan and details on how the plan works. John Turner, Leslie Muller, and Satyendra Verma look further into definitions of plan participation for defined contribution plans.[5] This work considers a number

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Exhibit 1. **Measuring the incidence of medical care and retirement benefits in the National Compensation Survey (NCS)**

The primary focus of NCS medical care and retirement benefits incidence data is a count of *employees*. The survey publishes two types of employee counts. One measure reports the proportion of employees who are participating in (covered by) medical care or retirement plans. The second measure reports the proportion of employees who are offered (have access to) coverage.

Both employee counts, participation or coverage and offerings or access, show the proportion of employees who receive or who are offered the benefit sponsored or paid for at least in part by the employer. These counts do not include employees who may have medical care or retirement benefits through another employer, via a second job, former job, or family member.

The NCS focuses secondarily on a count of *establishments*. This measure shows the proportion of establishments that offer medical care or retirement benefits to any employees in the establishment.

Thus, even if an establishment offered medical care to only a few of its workers, it would be counted as offering the benefit.

Establishments are usually single physical locations, such as a factory, retail store, warehouse, or doctor's office. Establishments are not synonymous with companies or firms, because a firm can have many establishments.

This article examines changes in both employee and establishment counts of the incidence of medical care and retirement benefits from the early 1990s to the early 2000s. BLS has changed some of its measurement concepts over that time period, in an effort to provide more useful data on benefit incidence. For a detailed explanation of earlier counting methods, see William J. Wiatrowski, "Counting the Incidence of Employee Benefits," *Compensation and Working Conditions*, June 1996, pp. 10–18, on the Internet at **http://www.bls.gov/opub/cwc/archive/summer1996art2.pdf** (visited July 30, 2004).

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of variables in arriving at plan participation numbers, including employer sponsorship, job coverage, eligibility, and current contributions. The authors provide a comprehensive analysis of the many alternative questions that need to be considered in counting covered workers. Beth Levin Crimmel analyzes data from the Medical Expenditure Panel Survey–Insurance Component on employer medical care offerings in 2001.[6] Finally, the Employee Benefit Research Institute regularly analyzes the latest benefits coverage data, and has conducted several recent examinations of alternative sources of benefits data.[7] Each of these sources provides background information on the many details involved in tracking benefits coverage.

Causes of declining benefits coverage

Changes in benefit coverage can be the result of many different factors:

- Legal changes, such as the introduction of 401(k) plans, can change the benefit packages available to employees or change the advantages employees can receive from those benefits. Changes in the law can prompt employers to offer plans or discourage them from doing so. Likewise, employees may change their decision to participate in a plan based on legal changes. For example, if a law or regulation change made it more difficult for employees to get access to funds in a defined contribution plan, they might be less inclined to participate in the plan.

- Employment may shift toward industries, occupations, or other segments of the economy that tend to

have particular types of benefits. For example, BLS employment data indicate a decline in the proportion of workers in goods-producing industries over the last decade.[8] To the extent that employers in these industries offer certain benefits more often than do employers in other industries, the shift in employment could affect overall benefit coverage.

- Employers may alter their benefit decisions due to financial concerns or changing labor needs.

Table 1. **Percent of workers participating in selected employee benefit plans, private industry 1992–2003**

Employee benefit program	1992–93	1993–94	2003
All workers			
Medical care	63	59	45
All retirement	53	50	49
Defined benefit pension	32	28	20
Defined contribution	35	34	40
Full-time workers			
Medical care	–	73	56
All retirement	–	58	58
Defined benefit pension	–	33	24
Defined contribution	–	40	48
Part-time workers			
Medical care	–	12	9
All retirement	–	19	18
Defined benefit pension	–	11	8
Defined contribution	–	12	14

NOTE: Dash indicates data were not collected or not tabulated in a given year.

- Finally, employees may alter their decision to participate in certain benefit plans, for a variety of reasons, such as the availability of benefit coverage from another source or concern about the cost of a benefit plan.

To pinpoint the exact cause of declining benefits coverage, a survey would have to study the same set of employees and employers throughout the period. BLS benefits data are from a sample survey, the composition of which changes at least in part each year.[9] Thus, the data reflect a variety of possible influences, including shifts in the composition of the labor force, changes in employer offerings, and changes in employee choices.[10] This article considers how each of these factors might influence benefits coverage.

This analysis looks at medical care, defined benefit pension, and defined contribution plans. These benefits have different traits and thus may react differently to influences. For example, employees often have to choose to participate in a medical care plan, and frequently must also agree to contribute toward the cost of the plan. Employees may decide not to participate, perhaps due to the high cost or to the availability of coverage from a spouse or another source. Defined contribution plans are like medical care in that employees usually must choose coverage and often must agree to contribute to the plan. In contrast, private-sector employers that provide defined benefit plans often make the plan available to all workers within a specific group (such as full-time workers) at no cost to the employee; there is no choice and typically no method for opting out of coverage. Based on these traits, one might expect that participation changes in medical care and defined contribution plans are influenced by different factors than are participation changes in defined benefit plans.

Labor force composition

Table 2 provides data on benefit coverage for selected populations in 2003. In general, these data indicate greater participation in medical care and retirement plans among full-time workers, union workers, workers in goods-producing establishments, and workers in larger establishments. Thus, shifts in employment among these populations may influence overall benefit coverage.

Changes in the composition of the Nation's workers by industry, union status, employment size, and full-time/part-time status during the last decade were analyzed to determine whether there were structural changes to the U.S. economy that may affect benefits coverage. Among the most prominent shift has been the employment decline in goods-producing industries—down from 24 percent to 20 percent of private industry employment. Looking beyond these percentages, the number of workers in goods-producing industries has remained relatively stable at between 21 million and 25 million over the last 10 years. At the same time, overall private-sector employment has risen from 91 million to nearly 110 million. This suggests that most employment growth has been in service-producing industries, which often have less benefits coverage.

Employment has also shifted from full-time to part-time work and from union to nonunion work. In terms of the employment size of establishments, larger employers (those with 100 workers or more) have increased their share of total employment slightly over the past 10 years. These employment shifts may have contradictory effects on benefit participation. Employment is shifting away from full-time union workers, who are more likely to have certain benefits, but also slightly toward larger establishments, which offer benefits more often.

Table 2. Percent of workers participating in selected employee benefit plans, by worker and establishment characteristic, private industry, 2003

Private sector workers/establishments	Medical care	All retirement benefit	Defined benefit pension	Defined contribution
All workers	45	49	20	40
White-collar workers	50	59	22	51
Blue-collar workers	51	50	24	38
Service workers	22	21	7	16
Full-time	56	58	24	48
Part-time	9	18	8	14
Union	60	83	72	39
Nonunion	44	45	15	40
Goods-producing industries	57	63	31	49
Service-producing industries	42	45	16	37
Establishments with fewer than 100 workers	36	35	8	31
Establishments with 100 workers or more	55	65	33	51

But is there a way to quantify the effect of these broad economic changes on the overall decline in benefits coverage? One approach is through a sensitivity analysis. A sensitivity analysis compares two variables, and tracks how one variable would change if the other variable did not change. For example, if defined benefit plans were frequently found among full-time workers and rarely found among part-time workers—and the composition of the workforce over a given period moved substantially from full-time to part-time workers—a sensitivity analysis would indicate how the proportion of all workers with defined benefit plans would have changed over the same time period had the full-time/part-time ratio not changed.

A detailed look at the sensitivity analysis approach may be found in the appendix. A quick way of ascertaining the impact of a single compositional effect is to multiply the composition change by the difference in participation rates in the base year. For example, the change in the part-time share of employment between 1992/93 and 2003 was about 3.94 percentage points (part-time employment rose from 19.54 to 23.48 percent of all workers); the difference in 1992/93 medical care participation rates between full-time and part-time workers was about 64 percentage points (76 percent among full-time workers, and 12 percent among part-time workers). The simple calculation, 3.94 percent times 64 percent (.0394 * .64), yields an estimate of the compositional effect of increased part-time employment at around 2.5 percentage points out of an overall decrease in medical care participation of 18 percentage points. Thus, 2.5 percentage points—about one-seventh of the total—can be attributed to the shift away from full-time work.[12]

This same approach, and the more detailed version specified in the appendix, was used to identify employment composition effects on medical care and retirement coverage between 1992–93 and 2003. Data are available from these years to conduct an analysis on the change employment among full-time and part-time workers, union and nonunion workers, and smaller and larger establishment (establishments with fewer than 100 workers and those with 100 workers or more). This analysis uses employment from the BLS benefits survey, which differs somewhat from the employment composition noted earlier from BLS employment surveys. Nonetheless, use of these employment figures is appropriate because these data were used to calcu-

late benefit coverage rates.[13] The following tabulation indicates the percentage of employment for selected groups, as identified by the benefits survey:

	Percent	
	1992–93	*2003*
Full-time	80	77
Union	18	9
100 workers or more	44	46

Table 3 indicates the results of this analysis. The results suggest that there are small compositional effects from several variables, most notable full-time/part-time and union/nonunion. The shift away from full-time workers resulted in a 2.5-percentage-point decline in overall medical care participation, while the shift from union to nonunion workers resulted in a 1.6-percentage-point decline. The shift to larger establishments actually resulted in a participation increase of less than 1 percentage point. While each alone may not have a large influence on overall benefit coverage decline, taken together the employment shifts account for about one-third of the decline in medical care coverage.[14] The remainder is attributed to changes in actual participation within establishments, which could be due to employer offerings or employee choices, as discussed below.

The sensitivity analysis showed a similar employment effect for retirement plans. For example, the shift away from

Table 3.	Effect of employment shifts from 1992–93 to 2003 on the percent of workers participating in selected benefits
Benefit/characteristic	**Participation in 2003**
Medical care	45 percent participation
Full-time	Decrease 2–3 percentage points
Union	Decrease 1–2 percentage points
100 workers or more	Increase less than 1 percentage point
All retirement	49 percent participation
Full-time	Decrease 1–2 percentage points
Union	Decrease 2–3 percentage points
100 workers or more	Increase less than 1 percentage point
Defined benefit	20 percent participation
Full-time	Decrease 1–2 percentage points
Union	Decrease 4–5 percentage points
100 workers or more	Increase less than 1 percentage point
Defined contribution	40 percent participation
Full-time	Decrease 1–2 percentage points
Union	Increase less than 1 percentage point
100 workers or more	Increase less than 1 percentage point

NOTE: Sensitivity analysis identified the effect of shifts in employment between 1992–93 and 2003 from one group to another. For example, the shift from full-time to part-time employment resulted in a 2–3 percentage point decline in participation in medical care plans.

union workers resulted in nearly a 5-percentage-point decline in defined benefit coverage.

Employer offerings

Another possible reason for the decline in the incidence of certain employee benefits throughout the past decade may be that employers—even in the same industry or employment size category—are not offering benefits as often as they once were. While the BLS benefits survey was not originally designed to capture the percent of establishments offering benefits or the percent of workers offered benefits, collection methods allow some estimates of plan offerings to be calculated. A study of BLS benefits data from 1992–93 [15] and new data from the BLS 2003 National Compensation Survey offer a glimpse into changes that might have occurred in benefit offering. (See table 4.)

While there are some methodological differences in the data from the 2 years, the changes in establishment offerings over the decade are striking.[16] In all cases except defined benefit pension plans, a greater percentage of employers offered benefits in 2003 than in 1992–93. Interestingly, the benefits that were offered more often in 2003—health insurance and defined contribution plans—are those benefits that frequently require an employee contribution. Thus, while employers might be providing employees with the opportunity to be covered by a benefit, coverage is not automatic. In contrast, employer offerings of defined benefit plans, which are almost always entirely paid for by the employer and provided automatically to employees, declined over the 10-year period.

Employee decisions

Data are not collected on the decisions employees make when selecting their benefits, but some data are available on factors that may influence those decisions. Among medical care plans,

between 1993 and 2003, the percent of all private sector workers with coverage who were required to contribute toward the cost of single coverage rose from 54 percent to 78 percent; for family coverage, the percent required to contribute also rose—from 74 percent to 90 percent. Further, for those required to contribute toward the cost of their medical care coverage, the monthly employee premium rose about 75 percent over the 10-year period, faster than the overall inflation rate.

Survey data indicate a difference between the percentage of workers offered employer-sponsored medical care and the percentage who actually participate in such plans. These data are used to construct a "take-up rate," which indicates the percent of those offered a benefit who actually choose to participate. Once again, recent survey data were designed to measure this concept, while prior survey data can be used to construct proxy estimates. In 1992–93, roughly 3 out of 4 private industry workers were offered medical care and 63 percent participated; in 2003, 60 percent were offered a plan and 45 percent participated. This amounts to a decline in the take-up rate from about 85 percent to 75 percent. Had the take-up rate remained at the higher rate in 2003, the percent of employees participating would have exceeded 50 percent.[17]

Similar evidence can be examined for defined contribution plans. In 1992–93, slightly more than half of participants in defined contribution plans were in savings and thrift plans. By definition, these plans require employees to contribute as a condition of joining the plan. Only if the employee makes a contribution is an employer contribution credited to the account. Most of the remaining participants were in plans that generally did not require an employee contribution, such as deferred profit-sharing and money-purchase plans.[18] In 2000, savings and thrift participants made up more than 70 percent of all defined contribution plan participants.[19]

The concept of take-up rate also applies to defined contribution plans, especially as more of these plans require an employee contribution. In 1992–93, roughly 4 out of 10 private

Table 4.	Percent of establishments offering selected benefits, by employment size, 1992–93 and 2003					
Benefit	**1992–93**			**2003**		
	All	**Small**	**Large**	**All**	**Small**	**Large**
Health insurance [1].......................	49	48	90	58	56	95
All retirement	28	24	80	47	45	88
Defined benefit	13	10	45	10	9	38
Defined contribution	20	19	64	45	44	82

[1] Data for 1992–93 refer to medical care benefits—plans designed to cover physical and mental health conditions. Data for 2003 refer to all health insurance benefits, including separate dental and vision plans not included in the 1992–93 data.
    NOTE: Small establishments have fewer than 100 employees; large establishments have 100 employees or more.

industry workers were offered defined contribution plans, and 35 percent actually chose to participate—a take-up rate of more than 80 percent. The more precise data from 2003 indicate that 51 percent of private industry workers were offered a defined contribution plan, and 40 percent participated—a take-up rate of 80 percent.

Because defined benefit pension plans tend to be available to private-sector workers at no cost, nearly all those offered a plan were also participants. There was little change in this relationship between 1992–93 and 2003.

A closer look

The evidence so far suggests one factor leading to the decline in medical care coverage is that, even when offered, employees are not choosing to participate in an employer plan. There may be various reasons for such a choice, including the availability of coverage from other sources. In a 2002 study, David Cutler attributes declining medical care coverage to employee decisions not to accept coverage, and further attributes those decisions directly to the increase in employee costs.[20]

New data from the BLS National Compensation Survey include medical care offerings, coverage, employee costs, and wage levels. For the first time, all of these data are available for the same occupations, which facilitate new analyses. Carl Barsky looks at some of these issues on pages 21–28. He notes, for example, that a greater proportion of higher-paid than lower-paid workers have access to and choose to participate in medical care plans. The take-up rate for those with average wages of $15 per hour and higher was 82 percent, compared with a 69-percent take-up rate for those with lower earnings. Additional regression analysis indicates a correlation between employee contributions and participation. As contributions rise, workers are less likely to participate.

More analysis to come

Evidence from the last decade shows that declining participation in medical care and retirement programs can be linked to a shift in the composition of the work force and, specifically for medical care, a rise in the proportion of employees who are offered a plan but decline to participate. Future data from BLS will allow these trends to be tracked over time and further decomposed by industry, occupation, and other variables.

This analysis is a starting point for more in-depth studies designed to provide further insights into changes in benefits coverage over time. Specifically, this analysis by design only looked at a single variable at a time. Plans are under way for more sophisticated multiple variable regression analysis to help discern what effects the combination of employment variables is having on benefits coverage.

New data that are now available from the BLS National Compensation Survey allow even greater analysis of benefits coverage in various sectors of the economy. These data can also be used to explore the details of individual aspects of benefits, such as the effect that changes in benefit plan features have on plan participation. As several years of these data become available, they will help to inform future trends in employer-provided benefits. ☐

Notes

[1] The term "medical care" is used throughout this article to refer to coverage for medical conditions, such as hospitalization, physician visits, and substance abuse treatment. Separate coverage for dental or vision care expenses was excluded from this analysis.

Due to changes in survey methodology, the percent of workers participating in medical care in 2003 excludes 8 percent of workers who had some type of coverage (medical, dental, vision, or some combination) that could not be identified in the survey data collection process. This may serve to exaggerate the decline in medical care coverage. In his article, "New statistics for health insurance from the National Compensation Survey," in this issue of the *Review*, Michael Lettau imputes a coverage type for the 8 percent of workers with missing data. After imputation, Lettau shows that 51 percent of workers have medical care coverage in 2003, identical to the participation rate found in the prior survey, conducted in 2000.

[2] A defined benefit plan provides a periodic benefit at retirement, which is derived from a fixed formula and is guaranteed by the employer. A defined contribution plan specifies a formula for depositing funds into an account for each employee, but does not guarantee a future benefit. The trend over the last quarter century has been away from defined benefit plans toward defined contribution plans. For more information on this trend, see Employee Benefit Research Institute, *EBRI Research Highlights: Retirement Benefits*, Issue Brief number 258, June 2003.

[3] Section 401(k) of the Internal Revenue Code, enacted as part of the Revenue Act of 1978, allows employers to establish defined contribution plans that permit employee contributions to be made on a tax-deferred basis. These plans, commonly referred to as 401(k) plans, became popular beginning in the early 1980s, once regulations addressing plan design issues were finalized.

[4] Diane Herz, Joseph Meisenheimer, and Harriet Weinstein, "Health and retirement benefits: data from two BLS surveys," *Monthly Labor Review*, March 2000, pp. 3–20.

[5] John Turner, Leslie Muller, and Satyendra Verma, "Defining participation in defined contribution pension plans," *Monthly Labor Review*, August 2003, pp. 36–43.

[6] Beth Levin Crimmel, "Employee Choice in Employer-Sponsored Health Insurance Plans: 2001," *Statistical Brief #29*, Center for Financing, Access and Cost Trends, Agency for Healthcare Research and Quality, U.S. Department of Health and Human Services.

[7] See, for example, Craig Copeland, "Employment-Based Retirement and Pension Plan Participation: Declining Levels and Geographic Differences," *EBRI Issue Brief*, October 2003.

[8] In 1993, 24 percent of private sector employment was in goods-producing industries, such as construction and manufacturing. In 2003,

20 percent of private sector employment was in goods-producing industries.

[9] In the BLS National Compensation Survey, approximately 20 percent of the employer locations (called establishments) in the sample are replaced each year with new establishments. For the years covered by this article, a similar, though less regular, sample replacement pattern was used.

[10] While there have been a number of new laws and court rulings throughout the past 10 years that could affect medical care and retirement benefit coverage, the timing of the BLS data do not correspond with the timing of these changes. Thus, it is difficult to determine what effect, if any, new laws and court rulings had on benefit coverage using these data.

[11] For more details on employment data from the Bureau of Labor Statistics, go to www.bls.gov/ces.

[12] The figures in the text may differ slightly from those in the appendix due to the use of rounded numbers in the text and more precise numbers in the appendix.

[13] While the BLS benefits survey was not designed to estimate employment, the share of employment in various groups is similar to that found in the Bureau's Current Employment Statistics program. For example, the Current Employment Statistics program shows that employment in goods-producing industries declined from 24 to 20 percent of private industry employment from 1993 to 2003. Data from the benefits survey show a similar decline—from 26 percent to 23 percent of private industry employment over the same period.

[14] The exact effect of all of the employment shifts taken together cannot be determined from the data, because some of the shifts are overlapping. For example, some of the shift from union to nonunion employment may have included a shift from full-time to part-time workers.

[15] William J. Wiatrowski, "Counting the Incidence of Employee Benefits," *Compensation and Working Conditions*, June 1996, pp. 10–18.

[16] The Bureau's benefit surveys are designed to capture data on the number and percent of workers with benefit coverage. Different methods were used to determine the percent of establishments offering benefits in 1992/93 and in 2003. In 1992/93, an establishment was counted as offering the benefit if at least one worker was found with the benefit. Because the survey only covers a sample of workers in each establishment, this method may serve to undercount the percentage of establishments offering coverage. In 2003, all establishments were asked if they offered coverage to any worker, regardless of whether any workers were counted as covered. In addition, data on the percent of establishments offering benefits in 1992/93 refer to medical care benefits, while 2003 data refer to the broader concept of health insurance (which may include separate dental or vision benefits).

[17] Because the 1992–93 survey did not specifically ask questions about the percent of employees offered benefits, several proxy estimates were derived. These estimates vary based on assumptions. For complete details, see William J. Wiatrowski, "Counting the Incidence of Employee Benefits," *Compensation and Working Conditions*, June 1996, pp. 10–18.

[18] A deferred profit sharing plan provides participants with a share of company profits, typically allocated to each participant equally or proportionally to salary. A money purchase plan provides a fixed employer contribution, typically a percent of salary, to each employee's account. These plans may allow optional employee contributions, but generally do not require employee contributions as a condition of joining the plan.

[19] These data indicate the percent of full-time employees who are covered by various types of defined contribution plans, not the percent of plans offered. If anything, these data underestimate the prevalence of savings and thrift plans offered among all defined contribution plans because participation in savings and thrift plans (which require an employee contribution) is generally a lower percentage of employees than is participation in other defined contribution plans (which typically do not require an employee contribution). Data on plan type are not yet available for 2003.

[20] David M. Cutler, "Employee Costs and the Decline in Health Insurance Coverage," National Bureau of Economic Research Working Paper 9036, July 2002.

APPENDIX: Sensitivity analysis

A sensitivity analysis compares two variables, and tracks how one variable would change if another variable did not change. The following example looks at the change in medical care participation and the change in the ratio of employment among full-time and part-time workers. The results indicate what effect the change in employment ratio had on the overall change in medical care participation.

Terms

ER = Ratio of employment

ERPT = Ratio of part-time employment to total employment

ERFT = Ratio of full-time employment to total employment

PR = Participation rate

PRPT = Participation rate among part-time workers

PRFT = Participation rate among full-time workers

PRALL = Participation rate among all workers, both part time and full time

Δ = Change from 1992/93 to 2003

Because all workers are either part time or full time,
ERPT + ERFT = 1.

Formula 1 shows how the participation rate for a given year for all employees can be expressed as the employment-weighted average of the rates for part- and full-time employees.

(1)   PRALL = (ERPT * PRPT) + (ERFT * PRFT)

For 2003, for example, formula 1 yields the following:

.45 = (.2348 * .09) + (.7652 * .56)

Participation rates and employment ratios for a given year can be expressed as the rates and ratios from another year plus the change in those rates and ratios from the chosen year to the given year. Formulas 2 through 5 express 2003 rates as the corresponding 1992/93 rate plus the change that occurred between 1992/93 and 2003.

(2)   ERPT2003 = ERPT1992/93 + ΔERPT1992/93

(3)   PRPT2003 = PRPT1992/93 + ΔPRPT1992/93

(4)   ERFT2003 = ERFT1992/93 + ΔERFT1992/93

(5)   PRFT2003 = PRFT1992/93 + ΔPRFT1992/93

Formula 6 recasts formula 1 for 2003 by expressing all 2003 variables as changes from the corresponding 1992/93 variables.

(6)   PRALL2003 = [(ERPT1992/93 + ΔERPT1992/93) * (PRPT1992/93 + ΔPRPT1992/93)] + [(ERFT1992/93 + ΔERFT1992/93) * (PRFT1992/93 + ΔPRFT1992/93)]

Multiplying formula 6 out yields:

(7)   PRALL2003 =

(ERPT1992/93 * PRPT1992/93) +
(1)

(PRPT1992/93 * ΔERPT1992/93) +
(2)

(ERPT1992/93 * ΔPRPT1992/93) +
(3)

(ΔERPT1992/93 * ΔPRPT1992/93) +
(4)

(ERFT1992/93 * PRFT1992/93) +
(5)

(ERFT1992/93 * ΔPRFT1992/93) +
(6)

(PRFT1992/93 * ΔERFT1992/93) +
(7)

(ΔERFT1992/93 * ΔPRFT1992/93)
(8)

Because the sum of terms 1 and 5 is identical to formula 1 for 1992/93, we will look to the other terms for insights into changes from 1992/93 to 2003.

Substituting values from the 1992/93 and 2003 surveys yields:

.45 = (.1954 * .12) + (.12 *.0394) + (.1954 * -.03) + (.0394 * -.03) + (.8046 * .76) + (.8046 * -.2) + (.76 * -.0394) + (-.0394 * -.2)

Simplifying these data yields:

.45 = (.023448) + (.004728) - (.00586) – (.00118) + (.611496) - (.16092) - (.02994) + (.00788)

The sum of terms 1 and 5 is .63, which is the value of PRALL for 1992/93.

The terms other than 1 and 5 show the effects of changes from 1992/93 to 2003.

Term 2 (PRPT1992/93 * ΔERPT1992/93), with a value of .004728, shows the impact of the increase in the proportion of part-time workers from 1992/93 to 2003, independent of other changes.

Term 3 (ERPT1992/93 * ΔPRPT1992/93), with a value of -.00586, shows the impact of the decline in the participation rate among part-time workers from 1992/93 to 2003, independent of other changes.

Term 4 (ΔERPT1992/93 * ΔPRPT1992/93), with a value of -.00118, reflects the joint effect (covariance) of the decline in participation rates among part-time workers and the increase in the portion of workers who are part time.

Term 6 (ERFT1992/93 * ΔPRFT1992/93), with a value of -.16092, shows the impact of the decline in participation rates among full-time workers, independent of other changes.

Term 7 (PRFT1992/93 * ΔERFT1992/93), with a value of -.02994, shows the impact of the decline in the portion of full-time workers, independent of other changes.

Term 8 (ΔERFT1992/93 * ΔPRFT1992/93), with a value of .00788, reflects the joint effect (covariance) of the decline in participation rates among full-time workers and the decline in the portion of workers who are full time.

Combining terms 2 and 7 yields a value of -.02522 and shows the impact of the changes in the mix of part-time and full-time employment, independent of other changes. This is called the "between sector effect."

Combining terms 3 and 6 yields a value of -.16678 and shows the impact of the declining participation rates among full- and part-time workers, independent of other changes. This is called the "within sector effect." Of course, there could be other compositional effects, such as a decline in the portion of unionized workers, which could account for this 17-percent change.

Thus, of the 18-percentage-point decline in overall participation rates between 1992/93 and 2003, 2.5 percentage points can be attributed to the shift from full-time to part-time workers. Nearly all of the remaining drop was due to declining participation rates among full-time and part-time workers.

Terms 4 and 8 have no appreciable effect on 1992/93 to 2003 changes. In general, unless the employment ratios and participation rates change dramatically, these terms will yield very small values and can be ignored. This is called the "residual."