Volume Title: Pensions, Labor, and Individual Choice

Volume Author/Editor: David A. Wise, ed.

Volume Publisher: University of Chicago Press

Volume ISBN: 0-226-90293-5

Volume URL: http://www.nber.org/books/wise85-1

Publication Date: 1985

Chapter Title: Pensions and the Labor Market: A Starting Point (The Mouse Can Roar)

Chapter Author: David T. Ellwood

Chapter URL: http://www.nber.org/chapters/c7129

Chapter pages in book: (p. 19 - 54)

2 Pensions and the Labor Market: A Starting Point (The Mouse Can Roar)

David T. Ellwood

Pensions have for some time been seen in the financial world as a major influence on capital markets. It is, after all, rather difficult to ignore the role of institutions that collectively hold assets that have grown in 1980 dollars from under $100 billion in 1950 to well over half a trillion dollars today (American Council of Life Insurance 1980). But until recently the possible labor market impacts of pensions have been largely ignored. The explanation perhaps lies in two different directions. First, pensions have often been treated by labor economists as one of many fringe benefits. If these have been considered at all, it has largely been in the context of how such benefits alter the total compensation paid by firms. A second possible reason may have been a conscious or unconscious acceptance of what Blinder has called a "Modigliani-Miller theorem for pensions" (Blinder 1982, p. 6). So long as capital markets are perfect, taxes are unimportant, and employees retain the full financial rights to whatever contributions are made on their behalf, it would seem that workers could always undo any effects of pensions.

If this Modigliani-Miller theorem breaks down, then, pensions could have very important effects in the labor market. With that much capital floating around, it certainly seems plausible that any peculiar characteristics of pension plans might cause dramatic changes in the incentives facing workers and their employers.

This paper is designed to serve as an introductory summary of the basic facts and figures involving private and public pensions with particular em-

David T. Ellwood is assistant professor at the John F. Kennedy School of Government at Harvard University and is a faculty research fellow at the National Bureau of Economic Research.

I am extremely grateful to David A. Wise for several discussions of the incentive effects of pension provisions. Daniel Smith provided excellent computer assistance.

phasis on those features of pensions which are likely to be of most significance for labor markets. The paper is divided into two main sections. The first examines both the historical and cross-sectional patterns of pension coverage and pension receipt in the United States. The second examines the magnitude of the incentives pensions might create in the labor market and the implications these incentives might have for retirement and turnover behavior of workers. It is my conclusion that these labor market effects could be quite large.

The emphasis in this paper will be on private pension plans. Publicly funded pension plans providing coverage for federal, state, and local employees will receive some attention. Unfortunately, data are often sparse, particularly for state and local plans, and rarely in a form comparable to those available for private employee plans. In part this is because the Employee Retirement Income Security Act of 1974 (ERISA) and other regulations generally do not apply to government plans. Social security receives no discussion except inasmuch as it interacts with other retirement plans. It has already received considerable attention elsewhere (see, e.g., Boskin and Hurd 1978; Blinder et al. 1980; Stein 1980). And although social security is arguably a pension plan, when I speak of such plans in this paper I refer to plans other than social security.

A large part of the facts presented here are taken from tables in the exhaustive (and exhausting) book by Lawrence Kotlikoff and Daniel Smith *Pensions and the American Economy*. Their sources for the figures used here typically are tabulations of a special pension supplement of the May 1979 Current Population Survey (CPS), of the income supplement of the March 1980 Current Population Survey, or of the 1977 Employee Benefit Survey (EBS1) which contains pension plan information required of employers by ERISA. Some additional tabulations of the May 1979 data are reported. Other sources are cited as they appear.

2.1 Pension Coverage and Pension Receipt

- Pension coverage and pension receipt have grown dramatically in the past three decades. Private pensions now cover at least 35% of the total civilian work force, government pensions another 10%–15%. Nearly 20% of all persons over 55 are receiving a private pension, and another 10% collect one from the government. Interestingly, the biggest growth in pension coverage came in the 1950s and early 1960s, while the growth in pension receipt has continued into the 1970s.

Figures 2.1 and 2.2 document the rapid growth in pensions. It appears that roughly 50% of the active work force now has some form of pension coverage and 20% of those over 55 collect some pension income. Still, perhaps the most intriguing feature of these figures is the fact that pension

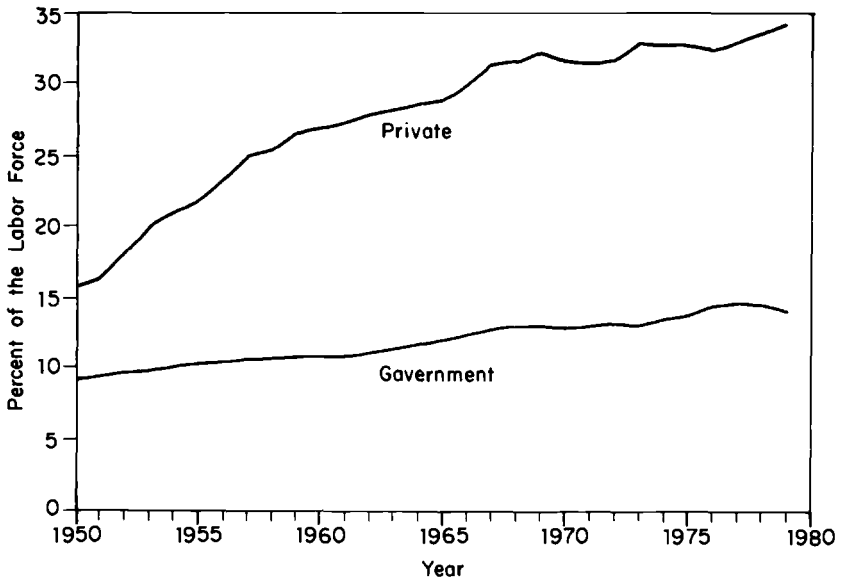

Fig. 2.1 Percentage of the labor force covered by pensions

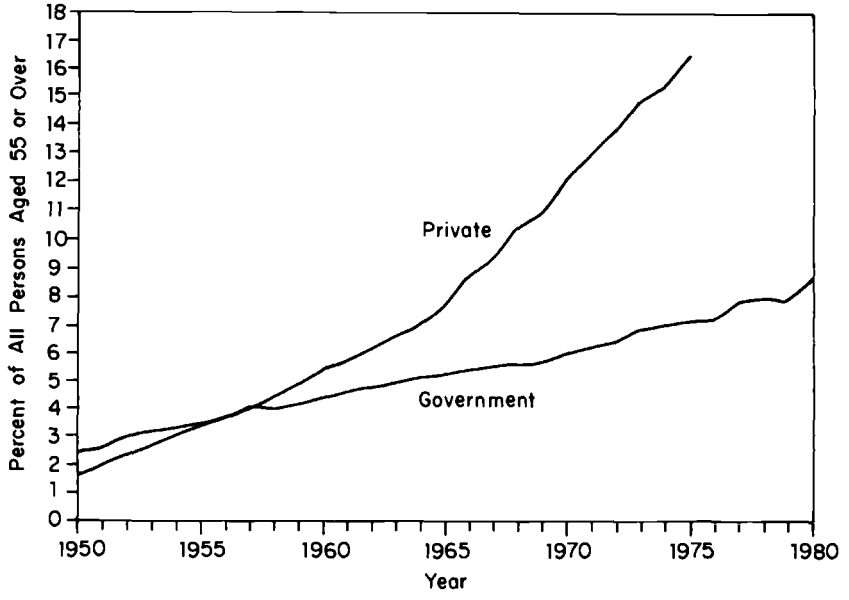

Fig. 2.2 Percentage of all persons 55 or over collecting pension benefits

receipt is still growing almost exponentially even though coverage appears to have leveled off in the past decade. The explanation lies in the rather lengthy gestation time before workers covered under a pension plan actually become eligible to receive benefits on retirement. And the large stock of elderly persons who retired before they had earned benefits under the growing pension plans in the late fifties and sixties is being diluted slowly.

In the next subsection I consider the correlates and determinants of pension coverage. Then I focus attention on pension receivers.

2.2 Pension Coverage of Active Workers

- Pension coverage is most common in the governmental sectors where at least 90% of workers are covered by some sort of pension plan.[1] In the private sector roughly half of all workers are covered. Pensions cover just under half of all private wage and salary workers.

Social security (OASDI) now covers virtually all private wage and salary workers. And although the real value of social security benefits has expanded greatly over the past decades, private pension coverage has also grown dramatically. For these workers pensions serve largely as a supplement. Many plans are explicitly integrated with the OASDI system. After periods of sharp growth in the 1940s and 1950s, private pension coverage appears to have leveled off in the 1960s and 1970s. Figure 2.3 shows that

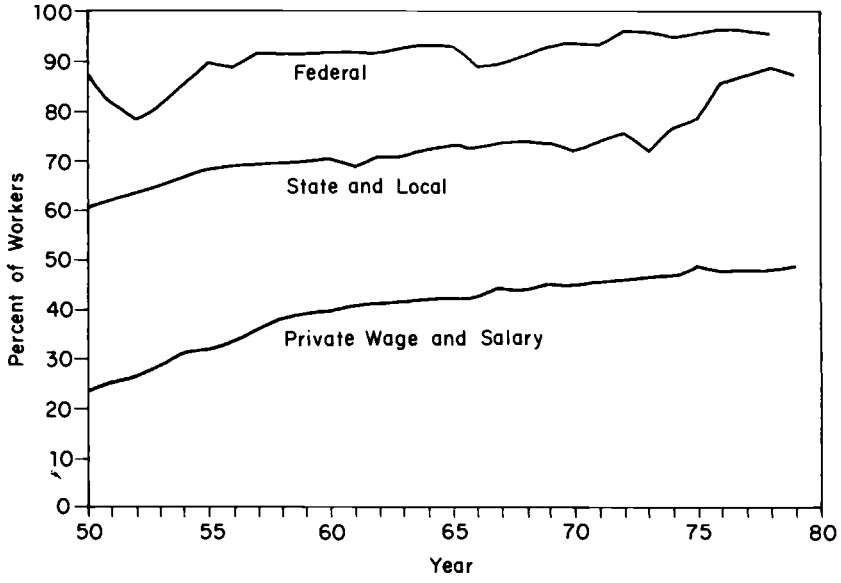

Fig. 2.3 Percentage of all workers with pension coverage by sector

between 1950 and 1960 coverage was extended from roughly 25% of the work force to over 40%. Coverage grew by about 5 percentage points in the sixties and 4 points in the seventies. By 1979 some 48% of all such workers had coverage.

By contrast, most federal workers and at least half of all state and local workers are not covered by social security during their employment in the public sector. Thus it seems plausible that these workers would be much more likely to have pension plans than other workers. Virtually all federal, state, and local employees have some form of coverage. State and local coverage climbed throughout this period and witnessed a sudden, and to my knowledge unexplained, growth spurt in the 1970s.

Coverage in the government sector is essentially complete, yet large portions of the private sector remain uncovered. One is naturally led to wonder why the growth in private pensions occurred in the fifties. The obvious place to look for answers is in the correlates of private sector coverage.

- Probably the single strongest determinant of pension coverage is union status. In 1979 nearly 80% of all union members reported that they were covered by a pension plan. By contrast only about a third of all nonunion workers reported such coverage.

Within industries, within income or age groups, within occupations, union members are much more likely to be covered by a pension plan than are nonunion workers. Figure 2.4 shows coverage of public and private wage and salary workers by one-digit industry and union status. In every industry union workers are much more likely to be covered. In a few the differences are quite dramatic. In construction, for example, over 80% of union workers are covered and less than 20% of nonunion workers are. It should be remembered, though, that since unions cover just 30% of all

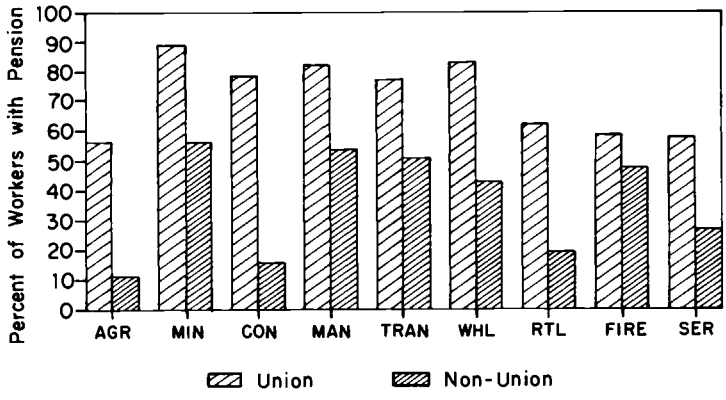

Fig. 2.4 Percentage of workers with pension coverage by industry and union status

workers, just over half of all workers covered by pensions are not union workers.

Another interesting feature of figure 2.4 is that industries that are disproportionately unionized also appear to have disproportionately high pension coverage, even in the nonunion sector. In the industries where unions have organized at least one-third of the work force (mining, construction, manufacturing, and transportation), union coverage typically exceeds 80%, and outside of construction, nonunion coverage is close to 50%. In other industries union coverage is typically less than 60% and nonunion coverage often falls below 30%. Apparently some of the same forces that favor unions also favor pensions.

It appears that the union market is largely saturated and has been so for some time. There is some evidence that the growth in pension coverage that has occurred has been most prominent in the nonunion sector. A study commissioned by Employee Benefit Research Institute (EBRI) reported that coverage growth rates for nonunion workers was twice that for union workers between 1968 and 1974 (Mathematica Policy Research 1979).

Traditional explanations for the high rate of union coverage look to both historical and economic influences. Unions may have used pensions as a way of gaining wage increases that were largely invisible to the general public and to wage and price control boards during the Second World War and the Korean War. Unions may also give more weight to older workers than the market does. Another factor may be economies of scale. Small firms may be forced to pay disproportionately high coverage and administrative costs. Unions could pool the employees of many firms and reap the economies.

The strong union component to coverage may have significant implications for the role pensions may play in the labor market. If pensions are seen as a device that might reduce turnover, the measurement of their impact in the union sector is confounded by the fact that many other features of unions are likely to reduce turnover as well (higher wages, more "voice," etc.). And if the growth of pensions is traced in part to their force in reducing turnover, one might expect them to be more prominent in the nonunion sector, which lacks at least some of the union-based methods of controlling turnover. On the other hand, if pensions are also a device for encouraging early retirement, their prominence in the union sector may indicate a greater desire on the part of union employers to separate older workers.

- Pension coverage is much more common in large firms than small ones. The decline in coverage associated with smaller establishment size is much less pronounced in the union sector.

Table 2.1 reveals that in the nonunion sector establishment size is an extremely powerful explanatory factor in pension coverage. Just 16% of

Table 2.1 **Percentage of Workers Covered by Pensions by Establishment Size and Union Status**

Establishment Size	Union (%)	Nonunion (%)
1-24	67.8	16.3
25-99	69.0	32.3
100-499	75.9	52.3
500-999	80.4	67.0
1000+	88.7	76.0
Total	76.4	33.7

Source: Tabulations of May 1979 CPS Survey.

workers in the smallest workplaces have coverage; 75% of those in the largest are covered. In the union sector the differences are much less pronounced. There is evidence that small firms are making the largest gains in coverage. The same EBRI study cited earlier found that between 1968 and 1974 coverage in the smallest establishments jumped by 13 percentage points. Coverage in the largest grew only 1 point.

There are abundant hypotheses that might be used to explain these findings. The most obvious focuses on the economies of scale just mentioned. Another would center on the mix of workers hired by small versus large firms. Yet another would be that larger firms are more fearful of unionization and thus seek to mimic benefits provided in the union sector.

It appears that union status and firm size are the two most prominent determinants of pension coverage. Whatever explanations are offered for the existence and growth of pensions ought to account for these key features.

- Younger, less educated, poorer, and female workers are all less likely to be covered by a pension plan. Nonwhite workers, on the other hand, seem just as likely to be covered as whites.

A familiar pattern emerges in figures 2.5, 2.6, and 2.7. Workers who gain lesser rewards typically are less likely to have pension protection. Lower rates of union coverage for these groups undoubtedly create some of these results. However, in results not reported here strong wage effects appear within the nonunion sector. Workers with higher wages are much more likely to be covered. It appears that pensions do little to equalize economic rewards. Indeed they appear to exacerbate existing differences.

One exception to this rule is in coverage of nonwhites. Overall white and nonwhites have very similar coverage rates. In figure 2.8 nonwhite men have slightly lower coverage rates and nonwhite women slightly higher ones than their white counterparts. The results for women are not too surprising since overall gross earnings no longer differ much by race. The results for nonwhite men may reflect their overrepresentation in unionized establishments.

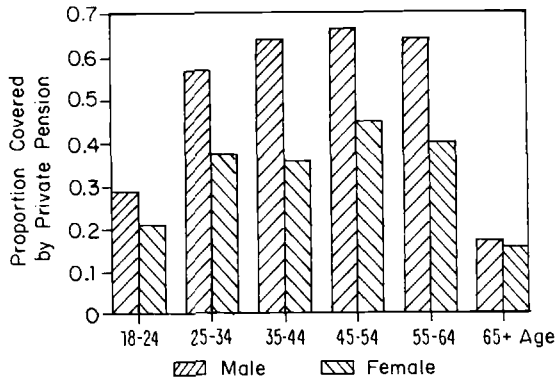

Fig. 2.5 Proportion of private sector workers covered by pensions by age

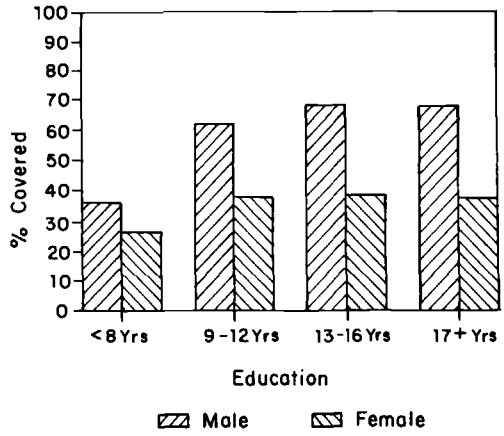

Fig. 2.6 Proportion of private sector workers covered by pensions by education

In summary, it does appear that pension coverage goes hand in hand with union representation, large establishment size, and the economic compensation in the labor market. The slowdown in growth in coverage during the 1970s may in part reflect the changing age, sex, industrial, and union mix of workers and employment. A simple back-of-the-envelope calculation I have done suggests pension coverage might have grown 3–5 percentage points more in this period had the mix been constant.

The collinearity of coverage with such important economic forces may make the effects of pensions in the labor market difficult to measure empirically. Nonetheless, for some workers, such as middle-aged men, pensions are quite common. Nearly two-thirds of all private wage and salary

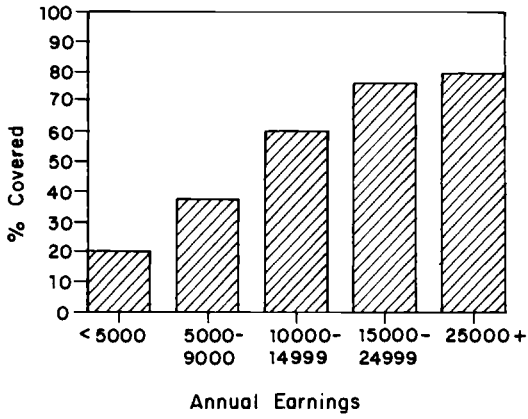

Fig. 2.7 Percentage of all private sector workers covered by pensions by annual earnings

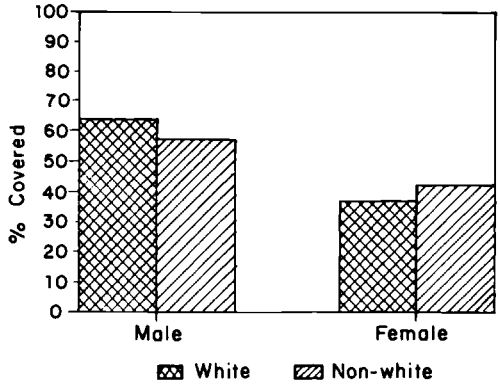

Fig. 2.8 Percentage of all private sector workers covered by pensions by race and sex

workers in this age group have coverage. As a result, it is certainly plausible that pensions have important influences in the labor market. Before addressing these issues, I shall consider the characteristics of pension recipients.

2.3.1 Pension Receipt

- Approximately one-quarter of all persons over age 65 receive some pension income. Among nonworking elderly males coverage reaches 41%. Patterns of pension receipt largely mimic patterns of coverage. Pension income accounts for only 15% of all income of persons over 65. But among pension receivers, benefits average 40% of income. Pensions

appear to exacerbate rather than compensate for existing differences in old age income.

Differences in old age income, in large part, reflect differences in previous earnings. Not surprisingly, pension receipt, like pension coverage, is highly correlated with personal characteristics that are associated with higher earnings during working years. Table 2.2 shows that men are more likely than women, better educated are more likely than less well educated, and the well-to-do are more likely than the poor to have pension coverage. Perhaps the only surprise about coverage on table 2.2 is that whites and nonwhites fare quite differently. These differences suggest that relatively equal coverage among blacks and whites is a recent phenomenon or

Table 2.2 **Pension Income by Sex, Race, Age, Employment Status, Education, and Income, 1980**

	Population Aged 65+		Pension Recipients Aged 65+	
	Received Pension Income (%)	Pension Income as % of Total Income	Average Pension Income ($)	Pension Income as % of Total Income
Male	38.5	18.6	4,251	38.3
Female	18.2	10.6	2,913	34.3
White	27.7	15.1	3,725	36.6
Nonwhite	15.9	13.4	3,450	43.7
Age 65–69	28.7	15.3	3,948	37.4
Age 70+	25.3	14.8	3,555	36.6
Employed	20.5	6.7	4,163	24.4
Males	24.8	7.5	4,698	25.1
Females	13.4	4.1	2,525	21.1
Not employed	27.4	17.7	3,660	39.4
Males	41.7	24.1	4,190	41.8
Females	18.6	11.6	2,935	35.5
Education				
0–8 years	18.9	9.7	2,396	32.7
9–12 years	28.4	14.7	3,360	36.9
13–16 years	37.7	19.1	4,996	39.6
17+ years	56.3	23.5	6,862	37.6
Income				
$1,000–2,499	2.2	0.9	730	41.0
$2,500–4,999	11.4	3.2	1,033	25.6
$5,000–7,499	42.6	13.8	1,981	31.9
$7,500–9,999	54.0	20.9	3,352	38.5
$10,000–14,999	58.9	24.2	4,960	41.1
$15,000–19,999	52.2	22.3	7,319	42.9
$20,000+	45.2	16.3	11,443	35.5

Source: Kotlikoff and Smith (1983) based on tabulations of March 1980 CPS data.

that nonwhites are less likely to qualify for benefits even though they are equally likely to be enrolled in a plan (i.e., they fail to meet the minimum service requirements to get benefits). The more interesting numbers concern the significance of pension income.

With only one-quarter of all persons over age 65 receiving pension income, it cannot be surprising that pensions account for only 15% of income in this age group. Among pension recipients such income is much more significant, though, accounting for roughly two-fifths of all income. Average benefits in 1980 were just under $4,000 for those between 65 and 69 and $3,500 in older groups. Among those with pension income, there is surprisingly little variation in the benefits as a fraction of total income. Those with low incomes get low benefits if they get them at all. Those with high incomes get high benefits. Since the incidence of receipt varies inversely with income, pensions clearly heighten rather than reduce income inequality.

An alternative measure of the financial significance of pensions for the elderly is to treat pension and other income streams, like social security, as assets and to compare pension wealth to total wealth. Several authors have attempted to do so. Kotlikoff and Smith (1983) report that in 1969 pensions represented 8% of the "old age resources" of couples whose head was between the ages of 58 and 63. Hurd and Shoven (1982) report similar results in 1969, using the same data but a slightly different methodology. By 1975, when the heads had reached ages 64–69, pensions had grown to roughly 11% of the total, presumably because more of them had retired and were now collecting pensions. Neither sources report figures exclusively for pension recipients.

- Persons who receive pensions typically collect amounts equal to 20% of their average wage over the final five years of their career. This "replacement rate" varies little by sex, union status, or level of earnings in the period prior to retirement. However, younger retirees and those with more years of service have higher replacement rates.

Pension benefits, like social security benefits, are closely tied to prior earnings. In most pensions the links are quite explicit: benefits or contributions are a proportion of earnings. And pensions nearly always grow along with length of service. Table 2.3 was created by Kotlikoff and Smith (1983) using data from a matched file of benefit payments paid to persons receiving pensions from a sample of large firms which was matched with the recipients' social security earnings history. Although the sampling design is not representative, the results are revealing nonetheless. When the dust settles from the benefit process, workers seem to average benefits of roughly 20% of their preretirement earnings, regardless of union status or sex or earnings. Though these demographic factors sharply influence who gets pension coverage, among those who do, replacement rates look very similar.

Table 2.3 **Average Benefits and Proportion of Preretirement Income Replaced by Pension Benefits by Union Status, Sex, Age, Length of Service, and Preretirement Earnings**

	Average Benefit ($)	Average Replacement Rate
Union status		
Union	3,543	.20
Nonunion	3,741	.18
Sex		
Male	3,957	.19
Female	2,548	.18
Age		
50–54	5,960	.27
55–59	4,817	.23
60–64	4,576	.22
65–69	3,832	.18
70–74	3,389	.17
75–79	3,026	.17
80 and over	2,841	.17
Years of service		
1–5	540	.04
6–10	1,060	.08
11–15	1,598	.10
16–20	2,159	.14
21–25	3,239	.17
26–30	4,626	.22
31–35	5,401	.25
36 and over	6,184	.27
Preretirement income		
Under $7,500	1,225	.25
$7,500–8,499	1,296	.16
$8,500–9,499	1,287	.14
$9,500–10,499	1,470	.15
$10,500–11,499	1,628	.15
$11,500–12,499	1,896	.16
$12,500–13,499	2,093	.16
$13,500–14,999	2,450	.18
$15,000–24,999	3,591	.19
Over $25,000	5,550	.19

Source: Kotlikoff and Smith (1983), based on tabulations of the Survey of Private Pension Benefit Amounts.

Note: Preretirement earnings are defined as the average level of real earnings in the fifth to the third year prior to retirement.

As one would expect, replacement rates vary with length of service. Somewhat unexpected is the finding that younger retirees have higher replacement rates. Being younger, they ought to have had less opportunity to accumulate benefits. In most pension plans it is possible to retire early. As will be considered below, the benefits from such early retirement are

often greatest for those with the longest service. Thus the results may indicate that some workers who have long service are electing to retire and claim their higher benefits. Those with lesser benefits accumulated tend to stay on until normal retirement age.

Old age income is in large part a reflection of previous earnings history. Since pensions are also tied to earnings, they do not ameliorate differences that result from past labor market outcomes. Persons who did better in the labor market typically have higher income when they are older, and they are more likely to have pension income. And, as noted above, among pension recipients, those with high income (even excluding the pension) have large pensions; persons with low income collect small pensions.

All of the results presented here indicate that pensions tend to heighten rather than compensate for differences in income among workers or the elderly. But their potential significance must not be missed. Half of the work force is enrolled in a plan that could provide 40% of their income when they are old. The important question that remains is, Do pension plans constrain strong incentives that might influence labor market behavior?

2.3 Market Impacts of Pensions

The most natural way for labor economists to examine the impact that pensions might have on the labor market is to view marginal pension wealth accumulation (or reduction) as an increase (decrease) in the effective wage. Because the true earnings profile differs from the observed wage payments, one would predict a variety of labor market responses by employees and employers that differ from those that might have been expected based only on the observed wages. The two types of behavior that have commanded the most attention in recent years are labor supply decisions, notably retirement behavior, but also work effort and labor turnover. Presumably pensions also influence hiring and layoff decisions of employers by changing the true cost of labor.

In this section I examine the provisions of pensions that might influence labor market behavior. I also provide some basic labor market data as background for the likely effects. The goal here is not to estimate the impact that pensions have on the labor market. Rather, I attempt to give the reader a rough idea of the magnitude of the incentives created by pensions and to point to the impact that various pension provisions have on these incentives. The effects that pensions might have on labor supply and on job changing are considered separately.

One other word of warning. Although I try to discuss provisions of both public and private pensions, the best data are available for private ones. Most of the calculations of the incentives created by pensions will implicitly assume a private pension plan is being considered.

2.3.2 Pensions and Labor Supply

- There has been a dramatic fall in the labor force participation rate of men over 55 in the past two decades. Participation of women in this age group was relatively stable, but the participation of younger women was increasing rapidly over this period. It may be that participation of older women also was depressed.

Figure 2.9 shows that between 1960 and 1980 the labor force participation rate for men aged 55–65 fell from 87% to 72%. For those over 65 rates fell from 35% to below 20%. The participation rates for women did not fall, but the contrast with the dramatic increases in paid economic activity for women in younger groups suggests that labor supply of these groups was also depressed. Several authors have attributed these declines largely to the increases in real social security benefits (e.g., Hurd and Boskin 1981), though others dispute the effects (e.g., Blinder et al. 1980; Gordon 1982). An obvious question is whether pension plans increase retirement incentives and whether the growth in pension plans contributed to this decline.

Pensions could have both a wealth and a substitution effect. Pensions add to the real wealth of workers who in turn may decide to consume more leisure, particularly late in their career. And they alter the effective wage. In general we tend to regard wealth as relatively fungible. Workers

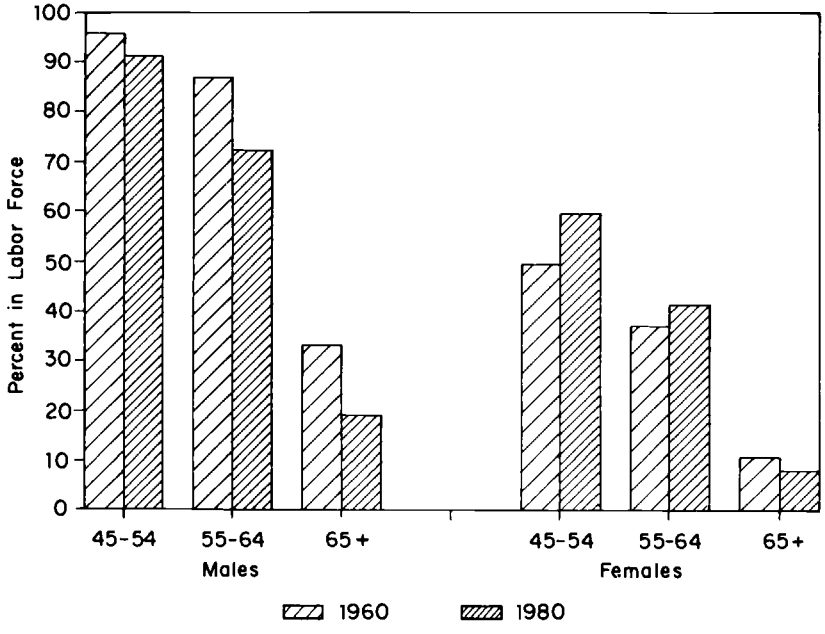

Fig. 2.9 Civilian labor force by race and age, 1960 and 1980

offered the choice between higher wages and pension benefits ought to be indifferent, unless there are tax advantages to pensions. Since there are such advantages, persons with pensions do make real income gains.

Pensions also distort the effective wage rate, and the impact of these distortions might be nontrivial. To understand these incentives we need to consider four key provisions of pension plans: the type of plan, the benefit formula, the normal retirement provisions, and the early retirement rules. Each will be considered and the impact that each has on pension wealth and the marginal returns to work will be reported for several hypothetical workers.

2.3.3 Plan Type

- Three-quarters of all persons and nearly 85% of all union members participating in private pension plans are enrolled in defined benefit plans where benefits are determined according to a specified formula. The remainder are enrolled in plans where benefits are directly related to contributions made on behalf of (and by) the employee and to the performance of the plan's investments portfolio. Virtually all government pensions are defined benefit plans.

Though their share of the pension market appears to have been declining in recent years, defined benefit plans still predominate. They seem to be most common for blue-collar workers in large firms. Defined contribution plans appear to be more common among professionals and highly paid white-collar workers. Profit-sharing plans and employee stock option plans are typically of this form. Smaller firms also are more likely to use this form of plan, perhaps to reduce the variability that a defined benefit plan can create. Blue-collar, and particularly union, workers seem most likely to have defined benefit coverage. Some union plans are actually a combination of the two, whereby employers make specified contributions to a union pension plan and then benefits are paid out according to some formula.

The type of plan has very important implications for the labor market impacts of a pension plan. Under defined contribution plans the employee typically gets out what has been put in for him. Once benefits are vested (once the employee can leave the firm and still collect his accrued benefits), the cost of leaving the firm is simply the value of lost contributions. The marginal cost of a year's lost contributions typically will be small in relation to total contributions for those with considerable service. In contrast, in "defined benefit" plans, benefit formulas are often such that benefits accumulate very rapidly late in a worker's career. The marginal cost of a year less service could be enormous.

- Most workers covered by defined benefit plans receive benefits based on a formula that increases pension benefits as length of service grows.

Union workers tend to receive a flat amount of money for each year worked. Nonunion workers tend to receive a percentage of average earnings in the last few years worked for each year of service.

The plethora and complexity of benefit provisions of defined benefit pension plans is overwhelming. The confusing nature of even a single plan suggests that economic actors are unlikely to respond exactly to the peculiar incentives of one or another plan. These complexities also raise interesting questions about the reasons for pensions. If pensions exist either to take advantage of tax benefits or to influence the economic behavior of workers and employers, then it is surprising that such complex institutional arrangements have developed.

Generally pension benefit provisions fall into one of two broad categories. Pattern or flat benefit plans pay a certain benefit per year of service. Kotlikoff and Smith (1983) estimate that the benefits averaged roughly $100 per year (plus or minus $70) for each year of service (though some plans have a formula whereby later years of service are compensated with greater pension increments). Thus a worker with 30 years of service would have received roughly $3000 per year in pension benefits had he retired in 1977. As shown on table 2.4, this type of plan is found almost exclusively in the private unionized sector.

Table 2.4 **Benefit Formulas for Participants in Private Defined Benefit Plans**

	Percentage of Participants		
	Union	Nonunion	Total
Formula based on earnings and service	21.0	71.1	42.1
Earnings base			
Final or highest 3 years	2.4	2.7	2.5
Final or highest 5 years	9.0	43.0	23.3
Final or highest 10 years	.6	9.5	4.3
Career average	9.0	15.9	11.9
Flat rate based on service only	47.1	19.6	35.6
Flat rate not based on earnings or service	12.2	.2	7.1
Other	15.3	6.6	11.6
Not classified	4.4	2.4	3.6
Total	100.0	100.0	100.0

Source: Kotlikoff and Smith (1983), based on tabulations of the Employer Benefit Survey 1977.

It is tempting to conclude that flat benefit plans are quite susceptible to inflation. In general such a conclusion probably is not appropriate. Since flat benefit plans are found almost exclusively in the union sector, the retirement benefit is renegotiated with each contract. Benefits can be and are adjusted upward with the cost of living. Flat benefit plans probably do redistribute income somewhat from better-paid workers to lower-paid ones relative to plans based on earnings. Nonetheless, it should be remembered that many union contracts cover only a narrow class of workers where income increases primarily with seniority. Plans often compensate more senior workers with greater benefits per year of service.

Conventional or unit formula plans are found almost exclusively in the nonunion private sector and the public sector. Benefits are computed as a percentage of some earnings base, most commonly average earnings in the five years prior to departure. The percentage grows with service. So, for example, annual pension benefits might be 1% of average salary in the final five years times years of service. A 30-year veteran would thus receive 30% of his salary.

These formulas often are quite complex. Many are integrated with social security in some way, either by reducing benefits by some fraction of social security benefits or by providing higher benefits for that portion of earnings over the social security maximum. Integration is much more common in the private sector (75% of unit formula plans) than in the public (under 15%), in large part because a large fraction of public workers are not included in the social security system while employed by governments. Trying to generalize about these formulas is treacherous, but as a rough approximation it appears that benefits average between 1% and 1.25% of earnings per year of service for plans using average earnings of the last five years as the base.

The definition of the earnings base obviously sharply influences the sensitivity of benefits to changes in inflation. Recent changes in inflation appear to have influenced the benefit formulas used. According to the Bankers Trust Survey of large pension plans in 1960, career average earnings was used as the earnings base in the overwhelming majority of conventional pension plans and only about 15% used earnings bases of five years or less. By 1980 only 20% reported using career average earnings and 75% used bases of under five years (Mischo et al. 1980).

- Defined benefit pension plans sharply twist the earnings profile. The increase in the effective wage from pension increments is greatest in the years just prior to retirement age and for workers with the greatest service. Inflation lowers the pension increment dramatically for younger workers and raises it sharply for older ones and for those with long tenures.

For purposes of illustration throughout this section, it seems useful to look at the impacts of a "representative plan" on several "representa-

tive workers." The purpose here is not to describe the exact incentives pensions create taking into account all of their individual peculiarities.[2] Rather the goal is to provide the reader with the orders of magnitude of the possible incentive effects.

I will examine the incentives facing a worker currently earning $15,000 per year who expects to see no real wage increases for the remainder of his career. This wage growth assumption is not realistic, of course, but it greatly simplifies understanding the results. The worker faces a 3% real interest rate. The nominal interest rate grows one for one with inflation. Finally, he is enrolled in a plan where benefits are computed as 1% of earnings in the final five years before departure from the firm. Though this obviously is not a flat rate formula, if the flat rate were $150 now, and if retirees in subsequent years would get the same real flat rate, the unit formula would be essentially equivalent to a flat rate. Benefits are assumed vested at five years.[3] In this first example, assume benefits begin at age 65. No cost of living increases are granted to retirees.

Table 2.5 shows the present discounted value of pension benefits and the marginal increment in this present value associated with an additional year's work. In this relatively conservative example the value of pension benefits can be quite high. At age 65, a worker with 40 years of experience has accumulated over $50,000 in benefits in a noninflationary environment. Inflation obviously lowers the real value of benefits since they are fixed in nominal terms on retirement, but even with 7% inflation the value is nearly $35,000. A worker with half as much experience has half as much pension wealth.

The incremental gain in pension benefits from each year's additional work suggests that pensions do in fact create some important incentives. When there is no inflation, the gain from one year more work is $150 (1% of $15,000) per year in pension benefits on retirement. At 3% discount rate the value of these benefits is roughly $1300 at age 65. Thus for workers near retirement, wages are increased by roughly 10%. However, at young ages this $1300 must be discounted and thus the present value of the increment is smaller for younger workers. The benefit increment depends only on age—not on tenure—when there is no inflation.

Inflation alters this image quite sharply.[4] Staying an extra year now has two effects. The worker raises his benefits by 1% of the wage again. But since benefits are fixed in nominal terms, the benefits of that increment are much smaller. There is a second effect, though. By staying an extra year, the worker increases his wage base by the amount of inflation. At 7% inflation this amounts to a 7% increase in the value of the pension. For younger workers who have accumulated little pension wealth, this effect is small. For older workers, on the other hand, this effect is quite large. Notice that this effect is also dependent on tenure because workers with greater tenure will have accumulated more pension wealth at any age.

Table 2.5 **Present Value of Accrued Benefits and Marginal Change in Benefits for Hypothetical Worker with No Early Retirement**

	Present Value of Accrued Benefits ($)		Marginal Change in Present Value of Accrued Benefits from an Additional Year's Work ($)	
	0% Inflation 3% Discount	7% Inflation 10% Discount	0% Inflation 3% Discount	7% Inflation 10% Discount
Current age	Starting age 25			
30	2,274	144	455	41
35	5,271	463	527	82
40	9,167	1,120	611	158
45	14,169	2,404	708	297
50	20,532	4,840	821	546
55	28,563	9,354	952	988
60	38,631	17,575	1,104	1,768
65	51,181	32,349	1,242*	2,794*
Current age	Starting age 45			
50	4,106	968	821	275
55	9,521	3,118	952	552
60	16,556	7,532	1,104	1,065
65	25,591	16,175	1,242*	1,764*

Assumes: Worker currently paid $15,000 per year with no real wage growth; worker will retire at age 65; pension plan pays 1% of average salary in last five years times years of service; pension plan contains no early retirement provisions or makes correct actuarial adjustment for early retirees; benefits are vested after five years; real discount rate is 3%, nominal rate increases one for one with inflation.

Notes: * indicates value calculated for age 64 rather than age 65; all values are constant dollars.

Thus in an inflationary environment, a year's more work adds just $108 in pension wealth for a 35-year-old with 10 years of experience. If the worker stays until age 65, though, the last year's work adds nearly $3000 in wealth. If the worker had started at age 45 instead, the last year's work adds roughly $2000 in pension wealth.

Thus pensions rotate the wage profile, and they rotate it most when there is wage and price inflation. Under a realistic scenario, where there are both real wage growth of workers as they age and inflation, pensions cause real wages of younger workers to rise only slightly. But for older workers and for those with considerable service, real wages can be increased by 20% or more.

Until retirement age is reached, pensions actually serve as a strong deterrent to retirement. The value of benefits increases most for workers

just reaching retirement age. After retirement age is reached, however, the incentives change quite dramatically.

- On reaching retirement age in defined benefit plans, benefits almost always are provided only for retired workers. Benefits rarely are adjusted upward for workers who retire late to account for the shorter period they will collect their benefits. In many plans pension benefits stop accruing at age 65. As a result there is often a strong incentive to retire at the normal retirement age.

Virtually all (90%) private retirement plans specify a normal retirement age of 65. About half of all participants are in plans that also have a minimum service requirement. These average roughly five years. Service-only requirements are essentially unknown. By contrast in the public sector, particularly in state-administered plans, the normal retirement age varies widely, but the mean is roughly age 60. However, most of these have longer service requirements, averaging over 10 years for state governments and nearly 15 years for local governments. When participants meet these requirements they can retire and normal benefits will begin.[5]

There is no broad-based data source providing information on accrual and benefits after normal retirement age is reached. Nonetheless it appears that in the majority of plans, accrual ceases once normal retirement age is reached. In many others there are limits on additional accrual. Virtually no plans seem to make provision for actuarial increases to compensate for the fact that late retirees will collect benefits over a reduced period. Almost two-thirds of the large single-employer pension plans surveyed by Bankers Trust in 1980 allowed no accrual after normal retirement (Mischo et al. 1980). Only 6% had actuarial increases. A 1979 Survey of Professional, Administrative, Technical, and Clerical Pay showed that roughly half of all pension plan recipients were covered under plans that prevented accrual after normal retirement and 25% more had accrual limits (Kotlikoff and Smith 1983).

As a result the large wage supplements created by pensions prior to retirement age rapidly become penalties. In the majority of cases, workers gain no additional pension benefits and lose a year's pension benefits for each year they continue to work. In the case of the hypothetical worker described above, a worker with 40 years of experience added $1200 to the value of his pension by working when he was 64. If he continued to work at 65, he would lose $6000 in benefits. A worker with 20 years of experience would lose half that amount. With this type of benefit formula one would certainly expect to see a large number of persons retiring at age 65.

One must be cautious in interpreting these results. Strong incentives are created to leave the firm at age 65. The worker still has the option of working somewhere else after this "retirement" and then collecting both salary and pension benefits.[6] Naturally in doing so he will have to endure what-

ever costs are associated with locating and adjusting to a new job. And the social security earnings test does tax such earnings rather heavily.

One might think that pensions had done enough to incentives with the provisions discussed thus far. But the effects of pension on retirement are further complicated by early retirement provisions contained in most plans.

- Although the normal retirement age under most plans is 65, over 80% of covered workers are in plans that make some provision for early retirement. And in the vast majority of these plans workers with service in excess of 20 years can retire early and collect pension benefits that are reduced either not at all or less than actuarially fairly in spite of the fact that the worker will collect benefits for a much longer period than one who retires at age 65.

Nearly all pension plans allow workers who have attained a certain age (typically 55) and have served for a minimum number of years (typically 10–15) to retire and collect benefits immediately. Because such workers will collect benefits for a longer period, their benefits ought to be reduced from what they would have been if the worker were retiring with the same length of service and salary at age 65. In defined contribution plans, where workers essentially get out what is contributed, such reductions are automatic. In defined benefit plans, on the other hand, where early retirement is available in plans covering 90% of all participants (Kotlikoff and Smith 1983), such reductions must be built into the benefit formula.

While data are not available for all plans, information from several sources indicates that very few plans reduce benefits by the full actuarially fair amount. The Bankers Trust survey reveals that in 1980 some 95% of the large defined benefit plans in their survey had early retirement plans that reduced benefits by less than the actuarially fair amount. And over 60% allowed some workers to retire early with full accrued benefits or greater (Mischo et al. 1980).

Accrual continues for nearly all workers eligible for early retirement if they elect not to take the early retirement option. As a result there are competing forces influencing the wage profile. On the one hand, the worker who keeps working continues accruing benefits and thus adds to his pension wealth. On the other hand, if benefits for early retirees are reduced by less than an actuarially fair amount, the value of the pension wealth he has already accrued actually declines because he loses out on some benefits he could otherwise receive. Which of these two effects is stronger depends on the benefit reduction formula and on the forces that influence the speed of pension accrual—namely, wage inflation and the benefit formula.

Table 2.6 shows what the marginal increments in pension wealth might be for our hypothetical worker if the pension plan allowed early retire-

Table 2.6 **Present Value of Accrued Benefits and Marginal Change in Benefits for Hypothetical Worker Early Retirement Allowed after Age 55 with Benefits Reduced Half Actuarially Fair Amount**

	Present Value of Accrued Benefits ($)		Marginal Change in Present Value of Accrued Benefits from an Additional Year's Work ($)	
	0% Inflation 3% Discount	7% Inflation 10% Discount	0% Inflation 3% Discount	7% Inflation 10% Discount
Current age	Starting age 25			
30	3,801	330	760	94
35	8,814	1,065	881	188
40	15,326	2,572	1,022	363
45	23,690	5,522	1,184	682
50	34,329	11,117	1,373	1,254
55	47,756	21,485	(665)	286
60	50,652	26,307	(1,174)	341
65	51,181	32,349	(1,598)*	461*
Current age	Starting age 45			
50	6,866	2,223	1,373	631
55	15,919	7,162	791	563
60	21,708	11,274	282	569
65	25,591	16,175	(141)*	628*

Assumes: Worker currently paid $15,000 per year with no real wage growth; worker will retire at age 65; pension plan pays 1% of average salary in last five years times years of service; benefits are vested after five years; real discount rate is 3%, nominal rate increases one for one with inflation.

Notes: * indicates value calculated for age 64 rather than age 65; all values are constant dollars; figures in parentheses are negative.

ment at age 55 and reduced benefits by just half the actuarially fair amount. In this example when there is no inflation, the pension system penalizes the worker with considerable service for working beyond early retirement. The penalty is over $600 at age 55 and it rises to $1600 by age 64.[7] When inflation is at 7% the benefit accrual is great enough to offset the depressing effects of the less than full actuarial reduction. And even in this case the incentives to remain at the firm created by the pension plan are diluted considerably.[8] For workers with less experience the depressing effects of early retirement are less severe, but strong nonetheless.

Based on these data, then, one is naturally drawn to the conclusion that for the 40% of the work force covered by defined benefit plans, benefit provisions could very well distort retirement decisions a great deal. Prior to early retirement age, pensions unambiguously increase the reward for

work. This ought to reduce retirement (and, as we shall see, job switching) in these years. After early retirement age is reached, the impact is ambiguous. In general early retirement incentives are most powerful for workers in plans where benefit reductions for early retirees are smallest and in environments where wage inflation is the lowest. After normal retirement age is reached, the impact of pensions is again unambiguous. The presence of a pension serves as a substantial penalty for further work. It thus appears that the growth of pensions could, in fact, be a major contributing factor in the decline in labor force participation of older workers, particularly for men, where coverage is now quite common.

For those in defined contribution plans there may still be wealth effects, but it appears that these plans do little to alter the shape of the compensation schedule. That both workers and firms opt for the much more invasive defined benefit plans certainly raises the possibility that these incentives are created purposefully.

2.3.4 Pensions and Job Changing

In this section the impact that pensions might have on job changing is considered. The term "changing" is used in preference to turnover because turnover would be created within a firm both by job changing and by retirement of employees. Since the latter was discussed above, attention in this section is focused exclusively on the former. Figure 2.10, which is derived from May 1979 CPS data, helps illustrate the distinction be-

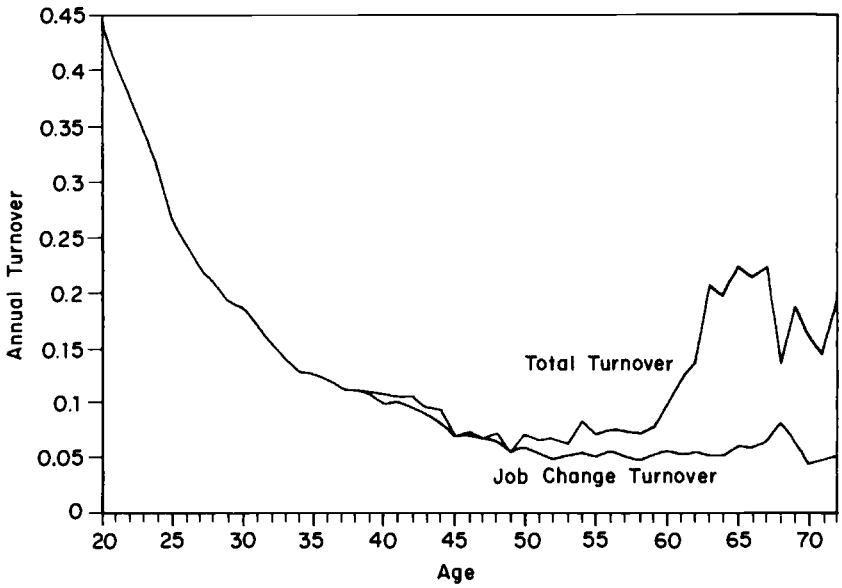

Fig. 2.10 Total turnover and job change turnover by age

tween turnover and job changing. The top line represents total annual turnover of male workers as seen by firms by age of workers. The lower line represents turnover created only by job changing.[9] That is, it reflects turnover created by workers changing jobs. In the later years there is a second effect—turnover is also created by persons leaving work and not returning. Thus employment for the cohort actually declines. At age 60 roughly 15% of male workers leave their firm. One-third that number show up the next year as new workers. Thus the remaining two-thirds leave employment.

- Total turnover is U-shaped, being high for young people due to job changing and high for older workers due to retirement. Job-changing turnover declines very sharply with age until age 55 when it increases somewhat. Job changing among persons over age 45, while considerably below the rate of younger workers, still affects between 10% and 15% of workers.

The figure suggests some important facts to consider when examining the potential usefulness of pensions in reducing turnover. Apparently turnover is a particularly serious problem for the young. Turnover is considerably less common among middle-aged workers, though whether the rates for these workers are low or high depends on one's perspective. Hall (1982) argues employment is quite stable at this stage. On the other hand, turnover rates of 10% imply completed employment spell durations which average only 10 years. Without independent evidence it is difficult to know if turnover of different aged workers is more or less costly to employers. If all turnover were equally costly, employers would presumably prefer that a vehicle like pensions have the greatest impact on turnover of younger workers. If job changing by experienced workers who have built up a great deal of job specific human capital is costly, the desired impact is ambiguous.

All the provisions that influence retirement also influence job changing. Moreover, two other features of pensions deserve attention in this context: initial pension eligibility provisions and vesting rules.

- Eligibility provisions are so minimal that virtually every worker over 25 with one year's service in a firm with a pension plan is enrolled in the plan.

ERISA essentially requires that every private worker over age 25 working in a firm with a pension plan for his class of worker must be covered. The law does allow persons who join the firm within five years of the normal retirement to be excluded, though three-quarters of all workers are enrolled in plans with no such exclusions. For older workers seeking a new job in a firm with a defined benefit plan, these provisions could be impor-

tant because the cost to the employer of providing the defined benefits grows rapidly as retirement age approaches.

Government plans tend to be even more liberal than private ones. Most have no eligibility requirements; those that do tend to have lower age limits than private plans with some restrictions (Kotlikoff and Smith 1983).

- Virtually every worker enrolled in a pension plan is fully vested after 10 years of service. Thus, after 10 years of service, workers can leave the firm and still be assured of receiving on retirement all benefits they had accrued to the point of departure. Most workers lose all benefits if they leave prior to 10 years of service.

A worker whose benefits are fully vested can leave his firm and still collect, on retirement, all of the pension benefits he has accrued. A worker who is not vested typically loses all rights to pension benefits on departure. Prior to the passage of ERISA there was a proliferation of vesting provisions. ERISA imposed certain limits on the maximum length of time a worker could be employed before he was vested in a private pension plan. There remains some flexibility in the vesting formulas. ERISA provided several options and allowed plans to adopt even more liberal provisions. Largely as a result of the laws, over 90% of private pension participants are now fully vested after 10 years of service to the firm (Kotlikoff and Smith 1983).

Most private workers (73%) are covered by 10-year "cliff vesting" provisions. Workers in these plans lose all benefits if they leave the firm before 10 years, but after 10 years on the job they become entitled to all benefits accrued prior to their departure. Most of the remainder of pension participants are covered by plans that cliff vest earlier or gradually vest benefits (Kotlikoff and Smith 1983).

Vesting provisions for defined benefit plans tend to be much more liberal than those for defined contribution plans. Table 2.7 shows that while just 4% of private workers in defined contribution plans are fully vested after five years, 42% of those in defined contribution plans are vested by that stage and another 26% are partially vested.

Less complete information is available about public pension plans, but evidence from Arnold (cited in Kotlikoff and Smith 1983) suggests that vesting provisions are somewhat more liberal than those found in private defined benefit plans. For example, over half of all state-administered plans are fully vested after five years, 98% after 10.

- Vesting provisions serve as a moderately strong device for reducing turnover among all workers with less than 10 years of service in an inflation-free environment. But during inflationary times, vesting rules are likely to have only a small effect on job changing by younger workers. The impact on older workers could be large, though this effect is

muted by the fact that most middle-aged and older workers have more than 10 years of service.

Workers who are not vested lose the present value of accrued pension benefits if they leave the firm. Table 2.8 shows that while the value of benefits can be quite large at very low discount rates, the value is relatively small for younger workers even with moderate discounting. Thus, contrary to popular belief, in the current inflationary times vesting probably does not serve as a strong deterrent to job changing by those under 40.

Table 2.7 **Vesting Provisions of Private Pension Plans Percentage of Workers Hired at Age 30 Who Would Be Vested by Length of Service (Participant Weighted)**

	Fully Vested (Partially Vested)		
Length of Service	Defined Benefit (%)	Defined Contribution (%)	All Plans (%)
1 year	.8 (.9)	18.1 (19.5)	4.8 (5.2)
3 years	2.0 (1.4)	23.8 (24.0)	7.0 (6.6)
5 years	3.6 (9.4)	42.6 (26.8)	12.5 (13.4)
10 years	92.5 (7.6)	91.7 (8.3)	92.3 (7.7)
15 years	100.0 (.0)	100.0 (.0)	100.0 (.0)

Source: Kotlikoff and Smith (1983), based on calculations from ESB1 File.

Table 2.8 **Present Value of Accrued Pension at Time of Vesting for Hypothetical Worker and Pension Plan by Age of Hire and Discount Rate**

	Discount Rate			
Age When Hired	0%	5%	10%	15%
25	$15,000	$2,680	$528*	$114
35	$15,000	$4,365	$1,370	$460
45	$15,000	$7,111	$3,553*	$1,861
55	$15,000	$11,583	$9,217	$7,528

Assumes: Hypothetical worker currently earns $15,000 per year, expects to retire at age 65 and live to age 75. Hypothetical pension plan pays 1% of final salary times years of service. Plan has 10-year cliff vesting.

Note: * these values differ slightly from the present value of accrued benefits after 10 years in the earlier example because average earnings over five years was used as the benefit base rather than final year's earnings.

On the other hand, for workers who join the firm at age 45 the value of benefits can be high even at moderate discount rates (or inflation levels). A worker using a 3% real discount rate in a time of 7% inflation (10% nominal discount rate) could lose the equivalent of nearly 25% of one year's salary by leaving his job.

Figure 2.11 demonstrates, however, that only about 20% of pension participants over 50 report that they are not vested, and another 10% are uncertain of their status. Among 40–50-year-old pension participants, just under 30% are sure that they are not vested. These are relatively small proportions, but those who are not vested may be more prone to job switching (hence their nonvested status), and vesting may provide the strongest incentives for those who are most likely to depart. In general, though, I would tend to conclude that vesting is not particularly important in times of high inflation. It is potentially most powerful for groups that generally are not affected by it and for groups in which turnover is already low.

Interestingly enough, although vesting may have very little effect on job changing in inflationary times, the other provisions of pensions can be very important, particularly when inflation is high.

- In inflationary times the benefit provisions of most defined benefit pension plans are in fact powerful deterrents to job switching even for the young and even if the alternative job offers identical wages and provides an identical pension plan.

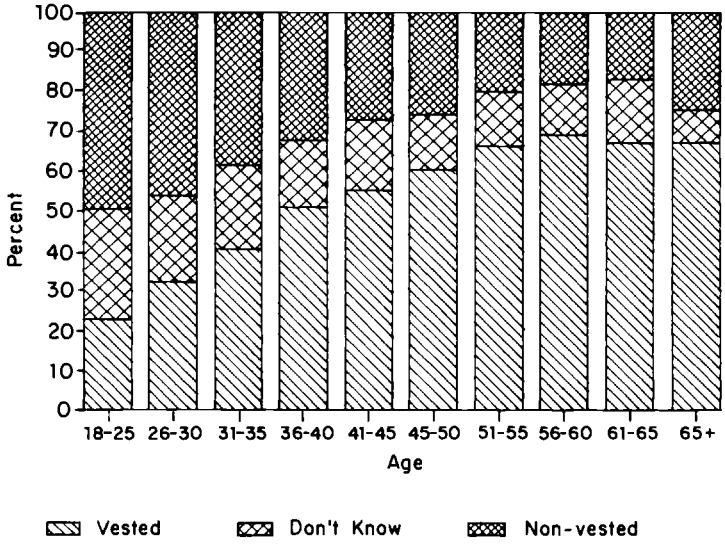

Fig. 2.11 Percentage of persons covered by pensions with vested and nonvested coverage by age

Consider a 35-year-old worker in 1983 with 10 years of experience working again at $15,000 per year in the "representative firm," which has a pension plan paying 1% of average salary in the last years at the firm times length of service. The worker intends to retire at age 65. If he stays with the firm until retirement he will be paid in annual retirement benefits 40% of his last salary. If he leaves now and finds a new job that offers him the same wage profile and an identical pension plan, it appears at first that he is just as well off. But note that at age 65 he will receive two checks: One from his new firm for 30% of his salary at age 65, and another from the first firm for 10% of his wage at age 35. If his wage at 65 is identical to the one at 35 he is equally well off. But if there has been even moderate nominal wage growth over this period, his wage at 65 will be vastly higher and the worker will lose a considerable amount in pension benefits. What he loses by switching jobs is the wage growth that would have pushed up the wage base used to calculate the benefits from the service already served at the old firm.

Table 2.9 indicates just how serious these losses can be. The magnitude is at first surprising since the marginal additions to pensions are small at younger ages. Remember, however, that when nominal wages are rising, the marginal value of increased pension wealth associated with one more year of work is related to both age and tenure. As a result, a job switcher who turns back the tenure clock is forced to accept a lifetime of smaller pension increments. The present value of all these lost increments can exceed $3000 for a 35-year-old with just 10 years of service even with no real wage growth and only 7% inflation. Obviously under stronger assumptions this $3000 would be low. In this case the incentive effects for older workers are just as great. A 55-year-old worker with 10 years of service also loses $3000. Although this worker loses increments over a shorter period, the losses are not discounted over nearly so long a period as are those for a younger worker.

There are still other reasons departure can be costly. Many pension plans offer early retirement with full benefits for some workers with long service. Since the value of these early retirement benefits can also be quite high, the worker again has an incentive to stay and accumulate service in only one firm. Finally, many benefit formulas are more generous for those with more years of service. For example, a plan might offer 1% of salary for the first 20 years and 1.5% for all years thereafter. Many union plans offer different flat rates for persons with short and long service records.

None of this applies to defined contribution plans. In these plans the worker has a certain amount set aside for him. Whether that money is in one employer's plan or another's ought to be a matter of some indifference. If he leaves one firm and joins a new one he retains his pension rights and loses no future benefits. One exception would arise if firms contributed more for workers with longer service.

Table 2.9 **Marginal Change in the Present Value of Benefits If Hypothetical Worker Works an Additional Year and Present Value of Lost Benefits If Worker Changes Jobs (No Early Retirement)**

	Marginal Change in Present Value of Accrued Benefits from an Additional Year's Work ($)		Present Value of Lost Pension Benefits If Change Jobs Now ($)	
	0% Inflation 3% Discount	7% Inflation 10% Discount	0% Inflation 3% Discount	7% Inflation 10% Discount
Current age	Starting age 25			
30	455	41	0	1,392
35	527	82	0	3,065
40	611	158	0	4,957
45	708	297	0	6,899
50	821	546	0	8,514
55	952	988	0	9,047
60	1,104	1,768	0	7,075
65	1,242*	2,794*	0*	2,007*
Current age	Starting age 45			
50	821	275	0	1,703
55	952	552	0	3,016
60	1,104	1,065	0	3,032
65	1,242*	1,764*	0*	978*

Assumes: Worker currently paid $15,000 per year with no real wage growth; worker will retire at age 65; pension plan pays 1% of average salary in last five years times years of service; pension plan allows no early retirement provisions or makes actuarially fair adjustment in benefits for early retirees; benefits are vested after five years; real discount rate is 3%, nominal rate increases one for one with inflation; if worker changes jobs he will work until age 65 at a new job which pays the same salary and offers an identical pension plan.

Note: * indicates value calculated for age 64 rather than age 65; all values are constant dollars.

Thus the benefit provisions of defined benefit formulas not only serve as a strong deterrent to retirement prior to the allowed age, they serve as a remarkably strong deterrent to job switching, even at very young ages. Whether such effects are intended or whether workers recognize them is yet another question. But in principle even young workers in relatively spartan plans lose a considerable amount of pension wealth by switching jobs even after the benefits are vested.

It is not the purpose of this paper to examine whether pensions do in fact reduce turnover. However, the data hint that such effects could be strong.

- Workers in pension plans have considerably longer tenure at every age.

Table 2.10 **Workers with Less Than 10 Years of Tenure by Pension Coverage Status, 1979**

Age	Covered (%)	Not Covered (%)
18–25	99.7	99.7
26–30	97.2	98.9
31–35	79.2	93.7
36–40	61.9	88.6
41–45	50.4	85.3
46–50	42.7	80.6
51–55	32.7	72.7
56–60	30.1	68.9
61–65	24.2	66.8
65+	20.8	64.3

Source: May 1979 CPS.

Note: Workers who do not know if they are covered are excluded from this table.

Table 2.10 reveals that workers who report themselves covered by pensions do in fact have much longer tenures. Whereas 73% of all workers aged 51–55 without pensions have less than 10 years of tenure, only about 33% of workers with pensions have been with their employer for less than a decade. Of course, such a table proves nothing. There are many possible explanations for the differences observed here. Still, the data do suggest that pensions may have sizable impacts for those in defined benefit plans.

This table should serve as a reminder as well. It simply is not appropriate to think of all workers in pension plans as though they had joined the firm at age 25 (even though I occasionally may have succumbed to that temptation in discussion above). A large proportion of covered workers still have less than 10 years of tenure even late in their careers. Thus total value of pension plans is reduced for these workers and the incentives are often weaker, although in the example presented here job-changing incentives were just as great. One must avoid the trap of using the 25-year-old entrant as the typical worker.

It is also important to remember that defined benefit plans only cover just over one-third of the work force, and over half of these are union workers. The other distorting effects of unions may be so severe that it is hard to ferret out the independent effects of pensions, particularly on turnover.

2.4 Conclusion

Pensions may in fact be an important influence in the labor market. After reviewing this evidence several points strike me as being particularly pertinent for those interested in labor:

- Pensions are most common in unionized firms and in large establishments.
- Because both pension receipt and the level of benefits are closely related to income, pensions complement other forms of compensation or income. Pensions do nothing to equalize incomes across groups.
- Defined benefit pension plans effectively increase the reward to work quite dramatically in the period prior to retirement age and substantially penalize work afterward.
- Even though vesting provisions may not provide much incentive to remain with a firm, the way in which benefits are calculated often creates a very high penalty for switching firms in an inflationary environment.
- The effects of pensions are extremely sensitive to inflation.
- In sharp contrast to defined benefit plans, virtually no labor market distortions arise from defined contribution plans.

Pensions do not apply to all workers. Some pensions look relatively neutral in the labor market. But for the 35%–40% of the work force covered by defined benefit plans, pensions could play a very important role in labor market behavior.

Notes

1. When I refer to coverage in this paper I will be referring to persons who are participating in some form of pension plan. Workers in firms with pension plans who are not participants themselves are meant to be excluded from these figures.

2. For a discussion of the exact effects of actual plans, see Kotlikoff and Wise (in this volume).

3. Ten years is a much more common vesting period. In the current example, however, a five-year vesting period simplifies the tables and presentation without changing the results.

4. For an excellent discussion of many of the effects of inflation on pensions, see Bulow (1981).

5. The sources for these statements are Kotlikoff and Smith (1983) and Mischo et al. (1980).

6. Recent work by Gustman and Steinmeier (1983) suggests that "retired" persons often work for new employers.

7. Note that the present value of pension benefits for older workers is greater even though marginal increments to work are negative because the value of accrued pension wealth automatically rises as the time to retirement is shortened and the benefits are discounted over a shorter period.

8. For a more detailed discussion of the impact of early retirement provisions, see Bulow (1982).

9. This figure was derived by expanding a technique described by Hall (1982). The basic idea derives from the fact that employment of age cohort °a′ in year °t′ can be described as

$$E_{at} = E_{at-1} - \text{leavers}_{at-1} + \text{new hires}_{at}.$$

New hires can be inferred from the number of persons with less than one year of tenure, E_{at} is measured directly, and E_{at-1} can be estimated from E_{a-1t} with an adjustment for population. Thus, leavers can be inferred. Turnover is just leavers/employment. Net declines in the number of cohort members employed cause retirement turnover. The remainder is caused by job changing.

Comment Zvi Bodie

You might be wondering why a financial economist is the first discussant at a conference on labor market aspects of pensions. The answer is that in the judgment of the conference organizers most of the basic scientific questions and policy issues regarding pensions cannot be properly addressed without considering financial and labor market aspects simultaneously.

Take, for example, an issue that arises immediately from David Ellwood's excellent analysis of defined contribution versus defined benefit pension plans: Why is defined benefit the most prevalent form? This question is puzzling to most economists because it would appear that an employer could always duplicate a defined benefit plan with a defined contribution plan costing the sponsor the same amount but offering the employee more options.

To illustrate this point, let us take Ellwood's numerical example in Table 2.5. A worker aged 30 earns a pension increment—a nominal deferred annuity—worth $41 under the defined benefit plan. For that same $41 cost to the firm the worker could be given a choice about how to invest the money in a defined contribution plan. His welfare would go up or at least stay the same (if he chose to invest in nominal deferred annuities) with no increase in cost to the firm. Isn't it in the best interest of all parties to have a defined contribution plan?

From a finance perspective I can think of four main reasons for the firm to prefer the defined benefit form.

1. *Funding*. Current IRS and ERISA rules allow firms considerable latitude in funding their accrued vested pension liabilities, which represent the only legally enforceable obligation the firm has to past and present covered employees. ERISA specifies minimum funding requirements designed to protect the PBGC against incurring a large liability for insured benefits on the termination of an unfunded plan, and the IRS sets maximum contribution limits to prevent the abuse of the tax advantages of pension plan overfunding. But these limits are quite broad, and in terms of the contribution to the fund in any given year they effectively allow the firm to contribute as little or as much as it wants.

Thus, should a normally healthy firm with a fully funded plan find itself in a short-term cash squeeze, it can always exercise its option to drastically reduce its pension contribution. The principal means at its disposal for doing so would be to alter its actuarial assumptions (e.g., raise its interest rate assumption), to produce a lower estimate of accrued vested

Zvi Bodie is professor of economics and finance at Boston University's School of Management and research associate, National Bureau of Economic Research.

benefits. Should the firm find itself in a more serious financial crisis, it has the option of drawing on this internal source of debt financing confident that even in the event of bankruptcy the PBGC will assume responsibility for most of the vested benefits of its employees. On the other hand, a healthy firm may want to exercise its option to overfund its plan and reap the benefits of the tax deferrals made possible thereby.

2. *Asset allocation*. Since the firm's liability to a worker under virtually all existing defined benefit plans is in the form of nominal deferred annuities, the firm could always hedge the risks associated with it by buying insurance contracts or by making equivalent investments in long-term fixed-interest securities. In fact, only a minority of sponsors choose to do so, and those that do tend to be the small plans.

Clearly, most sponsors try to earn "excess" returns on their pension funds, or, in their parlance, to reduce pension costs by superior investment performance. To be sure, if the investment results turn out to be truly superior, the sponsor can share the fruits with the plan participants by distributing ad hoc benefit increases. On the other hand, if investment results are poor and plan assets fall in value to levels below the vested accrued benefits, the PBGC may find itself with an underfunded plan on its hands.

3. *Accounting policies.* Under current rules of the Financial Accounting Standards Board, major corporations are required to state in their annual reports the market value of the assets in their pension funds, the accrued vested and nonvested pension liabilities, and the interest rate assumed in evaluating them. In principle, current and prospective shareholders and creditors of the firm as well as all other interested parties should be able to use these numbers to get a rough idea of the true magnitude of the firm's unfunded pension liabilities in order to compute adjusted debt/equity ratios and other measures of the firm's capital structure.

In an ideal informationally efficient capital market, the accounting treatment of these numbers should not matter to any of the parties making financial decisions relating to the firm. In reality, however, corporate financial officers and their creditors behave as if the accounting numbers do matter.

4. *Systematic overvaluation of defined benefits by employees.* Almost all defined benefit plans are extremely complex financial contracts requiring a fair degree of sophistication and knowledge in order to evaluate the benefits they provide. Although sponsors employ actuaries and other experts to enable them to compute the annual costs of benefits accruing under their plans, workers rarely are informed about how much they are actually earning in this form.

There is evidence that employees, particularly younger ones, are ill informed about the value of their accruing pension benefits and in some cases do not even know whether they are covered by an employer pension

plan. An hypothesis that could explain in part why corporations prefer defined benefit to defined contribution plans is that workers might systematically overvalue their accruing benefits because of failure to discount them properly.

A common link among all four of these possible reasons for employers to prefer defined benefit plans to defined contribution plans is that in each case the firm is shifting part of the cost of its pension commitments to other parties: the IRS, the PBGC, the investor community, or its own employees. To the extent that these affected parties are unaware of this cost shifting, it may be a source of public policy concern.

With these considerations in the background, the natural question I am led to ask the labor economists at this conference is whether there are any reasons, suggested by the theory of labor contracting, to believe that defined benefit pension plans are a more efficient arrangement than defined contribution plans.

In my role as discussant of David Ellwood's paper I have very little to say beyond praise for a job well done. I think he has done a fine job of extracting from Kotlikoff and Smith's gargantuan volume, *Pensions in the American Economy*, the most salient facts relating to labor market aspects of pension plans in the United States, and I will not repeat them in my comments. The latter part of his paper presents a good introduction to the features of defined benefit pension plans that are most likely to affect the labor market behavior of individuals—retirement and job change turnover decisions. Since a more detailed empirical treatment of these issues is the subject of the paper by Kotlikoff and Wise, which I have also been asked to discuss, I will treat that paper and the second half of Ellwood's together (see pp. 000–000 below).

References

Blinder, A.S. 1982. Private pensions and public pensions: Theory and fact. NBER Working Paper no. 902.

Blinder, A.S.; Gordon, R.; and Wise, D. 1980. Reconsidering the work disincentive effects of social security. *National Tax Journal* 33:431–42.

Boskin, M.J., and Hurd, M. 1978. The effect of social security on early retirement. *Journal of Public Economics* 10:361–78.

Bulow, J.I. 1981. Early retirement pension benefits. NBER Working Paper no. 654.

_____. 1982. The effect of inflation on the private pension system. In *Inflation: Causes and effects,* ed. R. Hall. Chicago: University of Chicago Press (for NBER).

Gordon, R.H. 1982. Social security and labor supply incentives. NBER Working Paper no. 986.

Gustman, A., and Steinmeier, T. 1983. Retirement flows. NBER Working Paper no. 1069.

Hall, R.E. 1982. The importance of lifetime jobs in the U.S. economy. *American Economic Review* 72:716–24.

Hurd, M.D., and Boskin, M. J. 1981. The effect of social security on retirement in the early 1970s. NBER Working Paper no. 659.

Hurd, M.D., and Shoven, J. B. 1982. The economic status of the elderly. NBER Working Paper no. 914.

Kotlikoff, L.J., and Smith, D. E. 1983. *Pensions in the American economy*. Chicago: University of Chicago Press (for NBER).

Kotlikoff, L.J., and Wise, D. A. 1985. Labor compensation and the structure of private pension plans: Evidence for contractual versus spot markets. In this volume.

Lazear, E.P. 1982. Pensions as severance pay. NBER Working Paper no. 944.

Mathematica Policy Research. 1979. *Review of Research on Retirement Income Programs, Section I.* Washington, D.C.: Employee Benefit Research Institute.

Mischo, W.J.; Chang, S.-K.; and Kaston, E. P. 1980. *Corporate pension plan study: A guide for the 1980s.* New York: Bankers Trust Co.

Munnell, A.H. 1982. *The economics of private pensions.* Washington, D.C.: Brookings Institution.

Stein, B. 1980. *Social security and pensions in transition: Understanding the American retirement system.* New York: Free Press.

This Page Intentionally Left Blank