Pensions and Training

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Economic analysis of private pensions commonly assumes that incentives for long tenure and early retirement enhance workforce productivity. An implication of the productivity theory of pensions is that workers who receive job training are more likely to be covered. We test this prediction with data from the Current Population Survey (CPS). We find a strong positive relationship between pensions and training, even after controlling for income and other worker and firm characteristics.

Introduction

Employers, economists, and policymakers are aware that defined benefit pensions can create important incentives for long job tenure and early retirement. Whether or not pension incentives are productive is a central issue in the debate over policies to enhance pension portability (Turner 1993). Greater portability would increase pension wealth and retirement income for workers who changed jobs frequently, but reduced incentives for long tenure may have adverse productivity consequences. A prominent idea in the economic literature on pensions is that defined benefit tenure and retirement incentives raise productivity by encouraging and preserving training investments in workers.[1]

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[1] Two recent reviews of the economic literature on pensions identify productivity gains as one of two broad reasons why firms offer pensions. Gustman, Mitchell, and Steinmeier (1994) and Parsons (1995) recognize that meeting employee preferences for tax-deferred retirement income is a major motivation. "Increasingly, however, labor economists and others have begun to believe that pensions are sometimes

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Becker (1964), in his pioneering study of human capital, suggested that delayed vesting was a policy to reduce quits of trained workers. More generally, the loss from quitting a job with a defined benefit pension may be seen as a "severance tax," which is a desirable feature in long-term employment contracts to prevent workers from leaving productive job matches (Carmichael 1989). Retirement incentives also are important when specific investments lead to long-term employment relationships. In the absence of mandatory retirement, a severance payment is needed to induce older workers to retire when productivity is expected to decline or become more variable (Blinder 1982; Lazear 1979).[2]

The assumption that pensions promote productivity gains supports much of the research on pensions in labor markets.[3] The relationship between pensions and productivity has not had much empirical testing, however, owing primarily to data limitations. The productivity model of pensions has a straightforward empirical implication; however, workers who receive employer-provided training are more likely to be covered by a pension. Although many empirical studies have been done on both private pension coverage and training, none has tested the pension-training relationship.[4]

We test the relationship between pensions and training using a new data set created by matching 1991 Current Population Survey (CPS) files. The results strongly support the prediction that pensions and training are joint outcomes of employment contracts: controlling for other worker and firm characteristics, we estimate a positive and significant relationship between pension coverage and training. Further tests do not clarify the mechanism that links pensions and training, however. We do not find consistent evidence that pension coverage is more likely to complement firm-

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supplied by firms because they have additional effects that cut labor costs and raise worker productivity . . . by reducing turnover, by providing incentives for the worker not to shirk, and by regulating retirement behavior" (Gustman, Mitchell, and Steinmeier 1994, p. 426). Parsons (p. 44) writes, ". . .firms might provide workers with a pension . . . to structure compensation in a way that induces desirable behavior from workers at least cost, shaping compensation profiles and bonding worker mobility and on-the-job performance."

[2] Economic historians have suggested that turnover reduction and facilitating early retirement were important factors in the early growth of private pensions (Williamson 1994). According to Graebner (1980), "Turnover reduction was a major goal of pension systems between 1910 and 1930 . . ." Employers also were reluctant to discharge workers whose physical skills had diminished and apparently found it difficult to reassign older workers at lower wages.

[3] These include Rice (1966), Schiller and Weiss (1979), Blinder (1982), Long and Scott (1982), Pesando (1984), Dorsey (1987), and Woodbury and Bettinger (1991). See also the review of empirical pension studies in Gustman, Mitchell, and Steinmeier (1994).

[4] Johnson (1996) has tested a relationship between training and pension benefits, but it is a demand theory—workers with training have higher lifetime income and choose pension coverage because of the tax benefits.

specific, rather than general, training. Also, training does not appear to raise the likelihood of coverage by a defined benefit plan relative to defined contribution coverage.

Empirical Model

From the firm's perspective, pensions make sense when long-term employment contracts are supported by firm-specific investments. Employers who share in the returns to training want to discourage quits. In addition, firm-specific investments can imply "overpayment" of older workers, in which case pension retirement incentives are valuable.[5] This article tests the prediction that workers who receive training are more likely to be covered by a pension.

Each of these variables is of course an endogenous outcome of worker and firm choices. Given that employers choose to invest in employee training, their willingness to sponsor a defined benefit pension increases. Simultaneously, the willingness of employees to accept deferred pension compensation, thereby bearing the costs of reduced mobility, will affect the training decision. Thus the preferred empirical approach is to jointly estimate structural pension coverage and training equations. Unfortunately, estimating the structural equations requires identifying restrictions that cannot be satisfied with existing data. Virtually none of the exogenous determinants of training can be a priori excluded from our pension model.

Identifying causal effects, however, goes beyond our more modest goal of testing for pensions and training complementarity. A finding of a zero, or negative, correlation between training and pension coverage is sufficient to reject this prediction of the productivity theory of pensions. Our basic empirical model therefore is a single-equation model of pension coverage with training variables included among the set of regressors. We emphasize that the coefficient on the training variable is a reduced-form estimate of correlation between pension coverage and training, controlling for other pension coverage (and training) determinants. It does not imply that causation runs only from training to pension coverage.

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[5] Overpayment occurs when the worker's value of marginal product falls below the wage late in the career. In the Lazear (1979) model, overpayment is intentional in order to deter shirking, and either mandatory retirement or a severance payment is needed to prevent workers from staying on the job too long. Blinder (1982) suggested that the specific training investments also could lead to overpayment and the need for retirement incentives. As pointed out by Parsons (forthcoming), however, additional assumptions about depreciating human capital and downward rigid wages are necessary.

Data

Until recently, no data set would have supported a test of the pension-training correlation. Most micro–data sets that included information on employee training did not include pension-coverage questions. This was the case with the January 1991 CPS, which included a detailed job-training supplemental questionnaire but no information on pension coverage. However, half of the January CPS rotation groups also were surveyed in March, and were asked about pension coverage at their main job during 1990. The March survey also includes information about firm size; and a second match to the March and April CPS identified respondents' union status. The latter two variables are important controls, both for training (Oi 1983) and for pension coverage (Parsons 1991). Matching the January, March, and April CPS files yielded a sample of more than 11,000 full-time, private-sector employees.

This data set has important advantages in addition to allowing controls for firm size and union membership. The CPS includes all age groups and both sexes. Other training surveys have focused on younger males or have oversampled low-wage workers (Brown 1990). Also, the CPS training questions provide information on type and place of training. Each employed respondent was asked: "Since you obtained your present job, did you take any training to improve your skills?" To those answering yes, additional questions were put concerning type of training, including reading, writing, and math skills, computer or other technical instruction, or managerial training. They also were asked where their training took place—in school, at the company's training facility, or informal on-the-job training (OJT). These additional prompts allow us to test whether training that is likely to be more firm-specific has a stronger correlation with pension coverage than general training.

We restricted the sample to private-sector, non-self-employed persons, aged 20–65, who reported working usually at least 35 hours per week. Table 1 presents sample means and standard deviations. According to Table 1, 45.3 percent reported receiving training at their current job, including 20.4 percent with formal training at the job, 18 percent informal OJT, and 12.9 percent receiving training in an outside classroom. These figures generally are consistent with estimates from other surveys.[6] Training also can be decomposed by type. Just 6.2 percent reported training in

[6] Altonji and Spletzer (1991), using the National Longitudinal Survey (NLS) of 1972 high school graduates, reported 28 percent receiving formal company training, 20 percent informal OJT, and 20 percent attending outside programs. Brown's (1990) survey found a range of company-provided training between 5 and 20 percent.

TABLE 1

MEANS AND STANDARD DEVIATIONS

	Mean	Standard Deviation
Training at Current Job	.453	.498
Training by Place:		
At Company—Formal Classroom	.204	.403
At Company—Informal OJT	.180	.385
Outside Company—Classroom	.129	.336
Training by Type:		
Reading, Writing, Math	.062	.242
Computer-Related	.161	.367
Other Occupation-Specific Technical Skills	.289	.453
Managerial	.136	.343
Pension	.548	.498
Years of Education	13.1	2.56
Years of Tenure	7.85	7.82
Female	.434	.496
Nonwhite	.116	.320
Age	38.3	10.8
Married, Spouse Present	.641	.480
Firm Size:		
25–99 Employees	.151	.358
100–499 Employees	.176	.381
500–999 Employees	.071	.256
1,000+ Employees	.411	.492
Union Member	.160	.366

Sample size = 11,269 observations.

general skills (reading, writing, and mathematics), while 16.1 percent reported computer training. Training in "other occupation-specific technical skills" was received by 28.9 percent, and 13.6 percent participated in programs aimed at developing managerial or supervisory skills. The percentage of workers participating in an employer-sponsored pension plan is 54.8, which is in the range of other reported CPS coverage estimates for full-time, private-sector employees.

Empirical Estimates

We estimated several specifications of a pension coverage equation using the probit procedure. Table 2 reports the partial derivative of each regressor calculated with its probit coefficient, evaluated at the mean of the independent variables. The estimate for the training variable is positive and significant in each model. Column 1 reports the simple correlation between pension coverage and training. Workers who report receiving training are nearly 17 percent more likely to have a pension, before other controls are included.

Column 2 introduces worker and firm control variables suggested by theory and previous empirical studies of pension coverage. These include age and income (Dorsey 1982), gender (Even and Macpherson 1990), firm size (Parsons 1991), and union status (Freeman 1985). A consistent finding has been that education increases the probability of pension coverage, perhaps because workers who invest in education are more willing to accept deferred income. Earlier studies also have found married workers

TABLE 2

PROBIT PENSION COVERAGE ESTIMATES[a]

	(1)	(2)	(3)
Intercept	-.069	-4.326	-3.822
	(4.32)	(22.83)	(21.19)
Training at Current Job	.169	.067	.105
	(17.78)	(6.09)	(9.87)
Education		.009	.028
		(3.78)	(12.92)
Married, Spouse Present		.051	.073
		(4.54)	(6.61)
Age		.051	.033
		(4.54)	(9.43)
Age-Squared		-.0002	-.0003
		(3.79)	(7.47)
Female		.008	-.084
		(.69)	(7.96)
Firm Size:			
25–99 Employees		.227	.243
		(12.48)	(13.68)
100–499 Employees		.336	.363
		(19.23)	(21.23)
500–999 Employees		.411	.454
		(17.87)	(20.13)
1,000+ Employees		.517	.555
		(33.10)	(36.52)
Union Member		.173	.195
		(11.25)	(12.92)
LN (Annual Wage Income)		.240	
		(23.90)	
Scale Factor[b]	.396	.395	.395

[a] The top row presents the partial derivative evaluated at the sample mean of the independent variables. It represents how a one-unit change in an independent variable changes the predicted probability of pension coverage. The second row represents the *t*-statistic for the associated probit coefficient.

[b] The partial derivative divided by the "scale factor" equals the associated probit coefficient.

Sample Size = 11,269 observations.

to be more likely to have pension coverage. This result may reflect higher marginal tax rates because of a spouse's income, or that married workers have greater job stability and thus value nonportable pension benefits more than workers who expect briefer tenure.

The estimates on the controls reported in column 2 are consistent with earlier studies. The probability of having a pension increases with annual wage income, education, and age. Also, persons who are employed at larger firms, are married, and belong to a union are more likely to be covered. After adding these controls, we estimate that workers with training are nearly 7 percent more likely to have a pension.[7]

It is noteworthy that the training coefficient remains positive after controlling for annual wage income. Part of the simple correlation between pension coverage and training likely reflects the tax advantages of pension compensation for higher-wage employees. Also, work by Gustman and Steinmeier (1993) suggests that pensions are part of an efficiency wage. If employers discourage quits of trained workers with such a compensation premium, pension coverage would be correlated with training even if career incentives were unimportant. These ideas suggest that including wage income will reduce the training estimate. When the income variable is excluded, as it is in the model reported in column 3, the estimated training parameter is substantially larger. Nevertheless, the likelihood of pension coverage is greater for trained workers, independent of higher wages.[8]

[7] The link between pension coverage and training also can be demonstrated by estimating each outcome as a function of worker and firm characteristics, and then comparing the coefficients across the two equations. The estimates for most of the variables are quite similar. Education, marital status, firm size, and age all significantly increase the probability of reporting both training and pension coverage. Age-squared has a negative coefficient in both equations. Different effects are found, however, for union, gender, and race. Union members have a higher probability of pension coverage, but are less likely to have training. The opposite is true for females. Nonwhites are less likely to report training, but race has no effect on probability of pension coverage.

[8] Wage income is endogenous, of course. Workers with higher total compensation have a greater demand for pension coverage because of tax preferences and higher lifetime income. Holding productivity constant, however, theory predicts a trade-off between nonwage benefits and current wages. It is prudent to test the sensitivity of the training coefficient to this endogeneity by estimating the model with an instrumental variable for predicted annual wage income. The pension coverage equation was identified because several variables that affect potential wage income were excluded a priori from the model of pension choice. The regressors in the reduced-form wage equation included all of the controls in the pension equation plus one-digit industry and occupation, tenure and tenure-squared, log (usual weekly hours), and log (weeks worked). The results, available on request, show that the estimated coefficient on the income instrument is larger than the actual income estimate, which is consistent with earlier studies (Dorsey 1982). The training coefficient declines in this specification, but remains positive and statistically significant. These results must be treated with caution because the wage equation is largely identified by tenure and tenure-squared and pension coverage is correlated with tenure. As a result, these two-stage results are not well identified.

General versus specific training. Table 2 presents clear evidence of a link between pension coverage and training, a relationship that is robust to controls for worker and firm characteristics. The productivity theory also predicts that pension coverage should be associated more closely with firm-specific training than with general investments. Human capital theory predicts that the costs of training in skills that are easily transferable to other firms will be borne by the worker. If training is completely general, the firm will be unconcerned about worker quits. The quit penalty will be applied only when the firm makes specific investments in workers.

Testing this implication is difficult, unfortunately, because a clean distinction between general and specific training is not available in this, or any other, survey of training. The categorization by type and location reported in Table 1, however, should reflect differences in the transferability of skills. Reading, math, and writing skills and computer-related training are arguably highly transferable across firms. Managerial and supervisory skills also would seem to be highly portable. Of the four training categories, investments in firm-specific skills are most likely to be reported as "other technical skills specific to the occupation."[9]

Place of training also may reflect differences in specificity. Programs at an outside classroom suggest general skills, whereas informal OJT is more likely to focus on firm-specific needs. Correlations between training type and place are consistent with this categorization. Table 3 lists Pearson correlation coefficients for all workers who reported receiving some training. The weakest correlation for the occupation-specific category is with training outside the company. Informal OJT has its highest correlation with occupation-specific training, and is least related to reading, math, and writing skills.

A test for differences by type and place can be made by replacing the single training variable with dummy variables for type and place of train-

TABLE 3

Pearson Correlation Coefficients for Training by Type and Place

	Reading, Math, Writing	Computer	Managerial	Occupation-Specific
Outside Company	.191	.131	.073	.013
Company Classroom	.067	.175	.201	.067
Informal OJT	.020	.052	.001	.070

[9] "Occupation-specific" could of course be transferable to other firms employing workers in the same occupation; however, workers who receive training that is clearly firm-specific are most likely to respond to this category.

TABLE 4

PENSION COVERAGE MODEL WITH CONTROLS FOR PLACE AND TYPE OF TRAINING[a]

	(1)	(2)
Training by Type:		
Reading, Math, Writing	.037	
	(1.52)	
Computer	.080	
	(4.93)	
Managerial	.017	
	(.96)	
Occupation-Specific	.054	
	(4.36)	
Other	-.009	
	(.41)	
Training by Place:		
Outside Company—Classroom		.039
		(2.39)
At Company—Formal		.097
		(6.88)
At Company—Informal		.020
		(1.45)
Other		.039
		(1.77)
Scale Factor[b]	.395	.395

[a] The top row presents the partial derivative evaluated at the sample Êmean of the independent variables. It represents how a one-unit change in an independent variable changes the predicted probability of pension coverage. The second row represents the *t*-statistic for the associated probit coefficient.
[b] The partial derivative divided by the "scale factor" equals the associated probit coefficient.
Sample Size = 11,269 observations.

ing. Each of the latter is equal to unity if the worker reported receiving that type of training. The categories are not exclusive: a large number of observations reported training under more than one category. Column 1 in Table 4 reports the coefficients on the type of training variables, with the excluded group being workers who reported no training. The results are mixed. Workers who received training in basic language and math or managerial skills were not significantly more likely than untrained workers to have a pension, as expected for general training, and occupation-specific training is positively related to pension coverage. Computer training, however, which is likely to be quite general, has the strongest correlation with pension coverage.

The results broken out by place (in column 2) indicate that the effect for training at the company is larger than training received outside the firm. Also, the place of training that is most likely to convey nontransferable skills, informal OJT, has the weakest relationship with pension coverage.

Defined benefit versus defined contribution pensions. The view that pension career incentives are intended to enhance worker productivity implies that training should be related to defined benefit pension coverage. The tenure and retirement incentives discussed above are relevant only for defined benefit plans. Defined contribution pensions usually are fully portable and are neutral to the age of retirement. Thus a more powerful test of the role of pension incentives is whether training is associated with a higher probability of defined benefit coverage.

Unfortunately, the March CPS pension data do not distinguish coverage by plan type. Type of coverage is provided by the pension supplement to the April 1993 CPS, but this file cannot be matched to the 1991 training supplement. We can use the 1993 pension supplement, however, by creating a training instrument using a procedure suggested by Madalla (1983). First, we estimated a probit training model using training as the dependent variable, with the 1991 data and the sample restricted to workers who had a pension. The coefficients from this model were used to calculate a predicted training probability for observations in the April 1993 sample. The predicted training variable then can be used as a regressor in a model of defined benefit versus defined contribution coverage.[10]

This procedure raises a concern about the nature of the identification restrictions. Previous empirical studies suggest a training equation that includes education, marital status, firm size, union status, gender and race indicators, and a quadratic age variable. We exclude gender, age, and race from the defined benefit-coverage model. The model also can be identified with industry and occupation controls; and we report estimates that test the sensitivity of the training instrument to inclusion of these exogenous variables. These identification restrictions are relatively weak and thus the results should be interpreted with caution.

Table 5 reports probit estimates of the probability of having defined benefit coverage, given that the worker is covered by a pension. The dependent variable is equal to unity if workers reported primary coverage under a defined benefit pension plan and zero if coverage was defined contribution. The results are consistent with previous estimates of the determinants of plan type (Dorsey 1987). Union members and employees at

[10] As noted by Murphy and Topel (1985), the standard errors for the predicted training variable coefficient are understated. However, using their procedure to estimate the correct variance-covariance matrix yields only a very slight increase in the standard errors. The results from their procedure are not presented because the technique uses $X\beta$ as the training instrument instead of $\Phi(X\beta)$. This makes quantitative (but not qualitative) interpretation of the training instrument results difficult. The Murphy and Topel technique results are available on request.

TABLE 5[a]

TRAINING AND DEFINED BENEFIT PENSION COVERAGE

	(1)	(2)	(3)	(4)[b]
Intercept	.043	-.019	-.000	.034
	(.63)	(.24)	(.01)	(.33)
Predicted Training	.188	.168	.157[c]	-.071[c]
	(1.16)	(1.03)	(2.62)	(.29)
Years of Education				
9–11	-.110	-.108	-.105	-.081
	(1.60)	(1.58)	(1.56)	(1.18)
12	-.152	-.152	-.145	-.093
	(2.16)	(2.16)	(2.38)	(1.33)
13–15	-.213	-.214	-.204	-.125
	(2.45)	(2.46)	(3.22)	(1.42)
16–17	-.229	-.237	-.225	-.151
	(2.53)	(2.61)	(3.47)	(1.76)
18+	-.163	-.175	-.160	-.100
	(1.72)	(1.84)	(2.38)	(1.17)
Married, Spouse Present	.014	-.017	-.014	-.002
	(.83)	(.97)	(.91)	(.12)
Firm Size:				
25–99 Employees	-.020	-.021	-.021	-.017
	(.64)	(.70)	(.71)	(.56)
100–499 Employees	-.001	-.002	-.001	-.002
	(.03)	(.08)	(.03)	(.08)
500–999 Employees	.004	.004	.006	.017
	(.12)	(.11)	(.16)	(.45)
1,000+ Employees	.056	.055	.058	.084
	(1.94)	(1.89)	(2.29)	(2.41)
Union Member	.234	.230	.230	.210
	(11.37)	(11.10)	(12.63)	(10.41)
Spouse's Pension:				
Defined Benefit	.162	.163	.163	.161
	(8.48)	(8.53)	(8.53)	(8.39)
Defined Contribution	-.143	-.142	-.143	-.144
	(6.83)	(6.77)	(6.82)	(6.87)
Other Plan	-.082	-.080	-.082	-.082
	(1.42)	(1.39)	(1.42)	(1.42)
Does Not Know	-.021	-.019	-.021	-.025
	(.44)	(.40)	(.45)	(.52)
LN (Annual Wage Income)		.023	.016	.028
		(1.63)	(1.10)	(1.81)
Scale Factor[d]	.397	.397	.397	.397

[a] Dependent variable is equal to unity if primary pension coverage is by a defined benefit plan and zero if by a defined contribution plan. The top row presents the partial derivative evaluated at the sample Êmean of the independent variables. It represents how a one-unit change in an independent variable changes the predicted probability of pension coverage. The second row represents the *t*-statistic for the associated probit coefficient.

[b] This equation included industry and occupation dummy variables as regressors (estimates not reported).

[c] The predicted training instrument in this column was estimated by including 12 industry and 6 occupation dummy variables as exogenous variables.

[d] The partial derivative divided by the "scale factor" equals the associated probit coefficient.

Sample Size = 6,221 observations.

large firms are more likely to be covered by a defined benefit plan. Greater education lowers the probability of defined benefit coverage.

Our focus is on the predicted training variable. Results reported in column 1, the model that does not include industry and occupation controls, indicate a large and positive partial derivative, but the estimate is not statistically significant. Column 2 shows that this result is not affected by adding the income variable. The predicted training estimates are sensitive, however, to the industry and occupation controls. When 12 industry dummy variables and 6 occupation controls were added to the reduced-form training equation, the predicted training coefficient in column 3 is virtually the same, but it is estimated much more precisely with a *t*-statistic of 2.62. However, when these industry and occupation variables are included in the pension model—and there is no a priori reason for excluding them from the pension equation—the estimate is essentially zero.

Our failure to reject the hypothesis of no effect of training on defined benefit coverage needs to be considered knowing that the coefficients used to generate the predicted training instrument were calculated using another data set. The resulting noisy estimator provides only a relatively weak test of the effect of training on the defined benefit/defined contribution choice.

Table 5 contains one other result of interest. Spouse's pension plan is an important predictor of type of coverage. The estimates imply that if the husband (wife) has a defined benefit plan, the wife (husband) is 16 percent more likely to also have defined benefit coverage. Defined contribution coverage of the spouse reduces the likelihood of having a defined benefit plan by 14 percent. The spouse is actually more likely to have a defined benefit plan if the partner has no pension.

Conclusions

The empirical results reported in this article support two primary conclusions. First, a strong, positive, and significant relationship exists between pension coverage and training. The correlation between these two job characteristics is high, even controlling for wage income, union status, firm size, and other worker and firm characteristics. Second, we do not find evidence that training raises the likelihood that workers who have a pension are covered by a defined benefit plan. Thus the rationale for the training-pension link is not clear. If an economic function of pensions is to reduce quits and encourage early retirement, workers with training should be more likely to have a defined benefit plan. Our results, based on an admittedly weak test, do not indicate that training alters the probability of defined contribution relative to defined benefit coverage.[11] This result is reminiscent of findings by Gustman and Steinmeier (1993) and Even and Macpherson (forthcoming) that lower quit rates for pension-covered workers are independent of the type of plan.

One interpretation of our results is that employers design an efficiency wage to reduce quits of trained workers, and pension coverage of either type is part of the compensation premium. The positive training coefficient did not evaporate, however, when wage income was added to the pension equation.

A different perspective is that defined contribution plans also provide incentives that are valuable to employers (Ippolito 1994). Firms that invest in training want to attract workers with low internal discount rates, and the deferred compensation created by either pension encourages "low discounters" to self-select. Defined contribution pensions, in addition, offer lump-sum payouts to quitting workers, which encourages workers with high discount rates who pass through the initial screen to leave. The newer 401(k) type of defined contribution plans also allows employers to match voluntary employee contributions, thus effectively targeting a compensation premium to low discounters. Our finding that training is associated with higher defined contribution coverage suggests that self-selection effects may be as important as tenure and retirement incentives.

The empirical results presented here are indirect and preliminary tests of the productivity perspective on pensions. The role of pensions in encouraging long-term employment is widely cited, but very little evidence exists to show productivity gains (see the Gustman, Mitchell, and Steinmeier [1994] and Parsons [forthcoming] reviews). More empirical research is needed to assess whether the pension productivity effects are important and to increase our knowledge of the economic foundations of pensions. An obvious topic for further study is the mechanism linking pensions and training. Our test of the relationship between training and type of coverage could be improved with a data set that includes both training and pension plan type. We were forced to use a training instrument, and the results likely are sensitive to identification restrictions. No currently available data set meets these requirements; however, a wave of the National Longitudinal Youth Survey scheduled for future release apparently will include more detailed information on pension plan type.

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[11] This result is consistent with the sorting theories of pensions such as Salop and Salop (1976); that is, pensions reduce turnover not because of quit penalties but because they attract workers with low quit probabilities.

In general, studies of the incentive effects of defined contribution plans should be a high priority. This research would increase our understanding of the steady growth in primary coverage by defined contribution plans over the past two decades. This trend is well known, but it does not necessarily imply that defined benefit incentives are unimportant. Much of the trend reflects structural shifts in employment away from large, union, and manufacturing sectors, rather than shifts in preferences (Gustman and Steinmeier 1992; Clark and McDermed 1990). The percentage of workers covered by defined benefit plans has declined relatively little in the latter sectors, where training and long-term employment are likely to be more important (Ippolito 1992). The evidence also suggests that legislative and regulatory changes have raised the relative cost of administering defined benefit plans and contributed to the switch to defined contribution plans by small, nonunion, service-producing firms. It also is possible that the ability of defined contribution plans to create incentives has encouraged this trend. Ippolito's (1992) results that indicate a substitution of 401(k) plans for defined benefit plans by large employers, for whom administrative cost savings are minor and gains from long-term employment are larger, suggest that defined contribution incentives are important.

We also recommend research that attempts to distinguish between the effects of the different pension incentives of self-selection, quit penalties, and early retirement bonuses. Defined benefit plans contain all three, but defined contribution plans have only the former. Anecdotal and historical evidence suggests that defined benefit plan sponsors believe retirement incentives are valuable. Retirement incentives may be a reason why defined benefit coverage has remained high in sectors of large, manufacturing firms.[12] Yet the growth of 401(k) plans among the latter indicates that some large firms are willing to forego this advantage. More directly, there is no systematic evidence that variations in retirement incentives reflect differences in training, technology, or any factors that affect the productivity of older workers.

Finally, almost no direct evidence on pension-productivity effects was found. Direct tests, as well as most of the questions raised in this section, require better data. Gustman and Mitchell (1992) and Parsons (forthcoming) have described in detail data requirements to test the productivity theory of pensions. A data set centered on employers, with information about production processes, workforce characteristics, and detailed information

[12] The following quote from an employee benefit specialist is representative. "The primary reason larger, international manufacturing firms provide private pensions is to remove the older, less-efficient employee from the work force in a socially responsible way. Firms do not provide pensions to recruit . . . (or) to tie employees to the work force and avoid recruiting or training costs. The fact that this occurs is incidental to the primary goal" (Marc W. Twinney, in Schmitt 1993, p. 98).

about the type of pension plan coverage, is the ideal. Such a data set would allow production function estimates as a function of specific pension incentives.

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