PRELIMINARY – NOT FOR QUOTATION

Are Firms or Workers Behind the Shift Away from DB Pension Plans?

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INTRODUCTION

The last twenty years have seen a significant change in the structure of pension plans. Between 1979 and 1998 there was a 17 percentage point decline in the proportion of employees covered by traditional defined benefit (DB) pensions, in which long tenure is compensated, and a 12 percentage point rise in employees covered by defined contribution (DC) plans where there is no penalty to leaving an employer. The factors underlying this shift, however, are the subject of some debate. In this study we estimate the contribution of changes in workforce characteristics and production environments to the shift in pension coverage. We estimate reduced form equations of the change in DB or DC coverage for 2-digit industries, using SUR. Pension coverage and demographic data are taken from the Current Population Survey and the Survey of Income and Program Participation. We merge in data on industry characteristics from a variety of sources.

Our findings suggest that shifts in the production environment explain a large part of the decline in traditional DB pension coverage. For example, it appears that technological change has weakened long-term employment relationships; industries with growth in multi-factor productivity one standard deviation above the sample mean had a 3.5 percentage point greater decline in DB coverage and 2.2 percentage point greater increase in DC coverage. We also find that industries facing increasing competition saw a decline in DB coverage; industries with a decline in the average return to capital one standard deviation above the mean had a 1.1 percentage point greater decline in DB coverage and a 0.8 percentage point greater rise in DC coverage. On the demand side, a rise in the proportion of the labor force with expectations of reduced job tenure (for

instance, individuals in dual-earner couples and married women with children) appears to have increased the demand for portable pensions on the part of workers. A rise in the proportion of dual earner couples one standard deviation above the mean reduces DB coverage by 1.3 percentage points and raises DC coverage by 3.0 percentage points. A similar rise in the proportion of women with children reduces DB coverage by 5.4 percent, while raising DC coverage by 1.6 percent. These results are robust to a variety of specifications, including accounting for the potential endogeneity of some of our measures through the use of instrumental variables. In total, the changes in workforce characteristics and production environments we consider can explain most of the decline in DB coverage; factors that are common to all industries, such as an increased regulatory burden of operating DB pensions post-ERISA account for about a third of the overall decline.

BACKGROUND

As shown in Chart 1, two-thirds of workers with pension coverage were covered by a DB plan in 1979 and one-third were covered by a DC pension. This pattern of coverage had nearly exactly reversed itself by 1998. While the aggregate statistics paint a clear picture of substitution of DC for DB pensions, the margin of substitution has changed over time making it difficult for researchers to establish that substitution was in fact taking place and confounding the identification of the determinants of the shift in pension coverage. Gustman and Steinmeier (1992) and Kruse (1995) examine firm-level data from the early 1980s and conclude that most of the reduction in DB coverage and the rise in DC coverage over that period was due to shifts in employment. Gustman and

Steinmeier, who do not follow firms over time, attribute the movement to declining employment in industries and at firms (large firms and unionized firms), that have traditionally provided DB pension coverage and a rise in employment in industries and firms that have not. Kruse follows firms over time and reaches the same conclusion, finding little evidence that firms made an explicit decision to alter their pension offerings. Using firm-level data from 1985 and 1992, Papke (2000) found more evidence of direct substitution of DC for DB pensions at individual firms. She found that 20 percent of sponsors dropped DB plans in favor of DC plans over this period, and that adding a 401(k) pension plan roughly doubled the probability that a firm would terminate its DB plan. Her contribution to the literature was to establish that direct substitution was indeed taking place. However she did not explore why firms were altering their pension offerings.

In order to understand why firms are moving to DC pensions, it is useful to understand the fundamental differences between DB and DC pensions. Both DB and DC plans offer employees the opportunity to earn tax-favored returns and to realize economies of scale on the transaction costs of investment. However, the accrual pattern of retirement benefits is quite different between traditional DB and DC pensions. Employees accrue few benefits early in their careers in a traditional DB plan, and then realize rapid benefit accrual in the years just prior to retirement. The back-loaded nature of benefit accrual in a DB pension plan thus imposes a capital loss on workers who leave the firm before retirement. Firms are generally thought to offer such arrangements in order to enhance productivity by reducing turnover, encouraging work effort, and

regulating retirement behavior.[1] Employees have few incentives to accept such a contract; however it has been suggested that firms may induce employees to accept these terms by sharing the resulting productivity gains (Lazear, 1979).

In addition to differences in benefit accrual patterns, sponsoring firms have traditionally assumed the financial market risk in DB plans and paid out benefits in the form of a life annuity. In contrast, participants in DC plans typically bear financial market risk as their retirement assets accumulate and benefits are paid out in a lump-sum either upon separation from the firm due to job change or at retirement.

Given the above discussion, it would seem that factors that reduce the benefits to workers or firms associated with long-term employment relationships could help explain the move to DC pensions. In particular, demand side considerations, which have been largely ignored in the literature, could be important in explaining the shift to DC pensions. There have been tremendous changes in the demographic structure of the labor force over the past 25 years that may have affected the attachment of workers to particular employers or to the labor force in general. An increase in the likelihood of job change would lead workers to place less value on compensation contracts, such as traditional DB pensions, that punish mobility.

The most prominent among these demographic changes is the entry of women into the labor force. Between 1979 and 1998, the share of workers who are female rose 16 percent. The rise in the share of women in the labor force has also implied an increase in the share of workers who are also caring for children or elderly parents. More caregivers in the labor force may imply an increased probability of leaving an employer.

1 Analyses of the role of DB pensions in the labor market can be found in Lazear (1979), Hutchens (1989), Mitchell (1990), Gustman, Mitchell, and Steinmeier (1994), Even and MacPherson (1996, 2001) and Friedberg and Owyang (2002).

In addition, the increase in the share of women in the labor force also implied an increasing share of workers, both men and women, who are in dual-earner households. Employer attachment may decline among dual earners as they will be more likely to change jobs with their partner.

The rapid pace of technological change in recent years may also have contributed to the shift in pension coverage. Theoretical papers by Ippolito (2001), Friedberg and Owyang (2002) and Balan (2003) suggest that back-loaded DB pensions could become unstable in the face of changes in production technology that lead to an increase in the relative return to skills that are transferable across firms versus firm-specific skills. Such a shift in production technology could increase the probability that employees receive a more lucrative outside offer of employment thus making the retention of employees with a DB contract prohibitively expensive even for firms that still realize a gain from longer tenure. Indeed there is empirical evidence to suggest that the return to human capital that is transferable across firms has risen faster than the return to firm-specific human capital in recent decades (Abowd, Lengermann, and McKinney, 2002).

In addition to changes in production technology, increasing competition in product markets over this period may have reduced the ability of firms to offer traditional DB pensions. The steep slope of benefit accumulation in DB pensions implies that workers are paid less than their marginal product when young and more than their marginal product when they are older (Lazaer, 1979). The ability of a firm to enter into labor contracts in which workers are not paid their marginal product implies a margin of economic profits. Some have suggested that DB pensions themselves are profit-sharing arrangements as a way of explaining why compensation has been observed to be higher

in jobs that offer DB pensions (Ippolito, 1994 and Gustman and Steimeier, 19xx). As employers face increasing competition from domestic and international producers, their profit margins, and thus their ability to offer implicit contracts such as traditional DB plans, will diminish. Bertrand (2004) has found evidence that employers in the U.S. are indeed moving towards spot markets for labor.

The demographic shifts that affect employee demand for pensions and the changes in technological and competitive conditions that potentially alter firm supply decisions are likely to differ across industries providing a vital source of variation for identifying the influence of these changes on pension coverage. In addition, there are factors that likely impact all firms more or less equally. One notion common in the literature is that federal regulation of private pension plans, beginning with the Employee Retirement Income Security Act of 1974 (ERISA), imposed costs and constraints on firms that sponsored traditional DB pension plans that , in turn, reduced the attractiveness of these plans. Several early papers found that much of the trend away from DB plans could *not* be explained by demographics or industry characteristics and concluded that the trend owed in large part to high administrative and compliance costs that had been imposed on DB plan sponsors with the passage of ERISA.[2] However, comparing the administrative costs associated with DB and DC plans has proven difficult and the relatively higher compliance costs associated with DB plans must be compared with the higher costs associated with administering individual accounts in DC plans.

In addition to affecting costs, regulation may have constrained firms from adjusting plan parameters in response to changes in economic conditions. For example, life expectancy has increased considerably among the general population in the United

2. See Clark and McDermed (1990), Gustman and Steinmeier (1992) and Kruse (1995).

States in recent decades. Holding the provisions of the pension contract constant, such a decrease in mortality would substantially raise the costs of offering a DB plan in which benefits are paid out as a life annuity. Employers could offset the effect of the rise in life expectancy by raising the retirement age specified in their plan; however regulatory considerations under ERISA make this a difficult proposition (Muir and Turner, 2003). Thus, the increase in longevity combined with constraints on the firm's ability to alter plan provisions may have induced employers to move toward DC pensions in which benefits are paid out as a lump sum.

Several of the hypotheses for the decline in DB pension coverage imply different patterns across industries and are thus identifiable using industry-specific demographic and technological measures. The effects of federal regulation affect all firms and thus are difficult to identify. In our approach, the effect of regulation, increasing longevity and any other factors common to all firms will be measured residually.

Empirical Strategy

Underlying our thinking about the evolution of pension offerings is a simple model of supply and demand. Start with implicit supply and demand functions in which price is a linear function of quantity and other determinants of supply and demand as in the following pair of equations

$$(1) \qquad \begin{aligned} p^{D}_{ijkt} &= \alpha_0 + \alpha_1 q_{ijkt} + \mathbf{X}^{D}_{ijkt}{}'\alpha + \mu_i + \nu_{ijk} + \varepsilon_{Dijkt} \\ p^{S}_{jikt} &= \beta_0 + \beta_1 q_{jikt} + \mathbf{X}^{S}_{jikt}{}'\beta + \eta_j + \nu_{ijk} + \varepsilon_{Sjikt} \end{aligned}$$

The top equation is the demand for a pension by an individual *i*, working at firm j, in industry *k*, at time *t*. In the demand equation, $\mathbf{X^D}$ is a vector of individual characteristics thought to determine the preferences for pension coverage such as marital status and presence of children. Similarly $\mathbf{X^S}$ in the supply equation is a vector of variables thought to determine the firm's decision to provide pension coverage such as whether there is a union and the size of the firm. In the structural equation, we allow there to be individual and firm effects (μ_i and η_j respectively) as well as an individual/firm match specific effect v_{ijk}, which captures the fact that people sort into specific jobs and are not randomly assigned. Unfortunately, we do not observe the underlying supply of and demand for pensions in our data. We observe only the equilibrium outcome of firms' pension offerings and individual take-up rates. However, we do have enough data to estimate the reduced form equation, which we observe by setting supply equal to demand. The equation is the typical one:

$$p^D_{ijkt} = p^S_{jikt}:$$

$$q_{Ekt} = \frac{\alpha_0 - \beta_0}{\beta_1 - \alpha_1} + \frac{\mathbf{X}_{ijkt}'\alpha}{\beta_1 - \alpha_1} - \frac{\mathbf{X}_{jikt}'\beta}{\beta_1 - \alpha_1} + \frac{\mu_i}{\beta_1 - \alpha_1} - \frac{\eta_j}{\beta_1 - \alpha_1} + \frac{\varepsilon_{ijkt} - \varepsilon_{jikt}}{\beta_1 - \alpha_1} \quad (3)$$

From this equation we cannot recover the structural parameters directly, but we can see whether, in equilibrium, these variables have the expected effect. Note that the match specific effect drops out of this equation.[3]

3 If the match effect had different factor loadings in the two equations then it would not drop out of the equation and it would be another potential source of endogeneity in the equation, in addition to the individual and firm effects discussed below. Previous research has suggested that sorting on health care coverage is minimal (x). Although similar evidence does not exist for pension coverage, there is little reason to think that sorting on pension coverage would be greater.

We are interested in how pension coverage has changed over time---particularly whether firms offer defined benefit or defined contribution plans. However, we don't observe individuals over time, so we average the data to the industry level and then take differences. Relabeling the coefficients the equation that we estimate is :

$$\Delta\bar{q}_{Ekt} = \gamma_0 + \Delta Z_{kt}'\Gamma + \frac{\bar{\mu}_{it} - \bar{\mu}_{it-1}}{\alpha_1 - \beta_1} - \frac{\bar{\eta}_{jt} - \eta_{jt-1}}{\alpha_1 - \beta_1} + \omega_t \tag{4}$$

where Z includes both the supply- and demand-related variables, and ω_t is the composite error term (which is by construction heteroskedastic and must be corrected).

The only problem with estimating this equation is that individuals and firms are not constant over time within industries and so we can't rule out that there might be changes in the average unobserved characteristics of individuals and firms in a particular industry. If these changes are correlated with changes in the explanatory variables, then the estimated coefficients may be biased. In order to reduce this problem, we include a variety of control variables, discussed in the data section, that we think are likely to be related to changes in unobserved individual and firm characteristics. We also test for the consistency of the OLS estimates.

Data

We examine the change in pension offerings over the 20 year period from 1979 to 1998. Information on pension coverage in the earlier period is obtained from the 1979 May supplement to the Current Population Survey (CPS), while data on pension coverage in the later period comes from the 1998 pension supplement to the 1996 panel of the Survey of Income and Program Participation (SIPP).

Data from the CPS in 1979 did not clearly delineate between DB and DC pension coverage. We defined a person as being covered by a DB plan if they were covered by an employer-sponsored retirement plan but did not make contributions. Those who participated in an employer-sponsored retirement plan that they contributed to were considered to have DC coverage. Given the prevalence of DB pensions in 1979, and the limited array of DC plans relative to today's standards, all people who reported having more than one pension were classified as having both DB and DC coverage. Data for 1998 from the SIPP had better indicators of pension type; respondents were asked whether their benefits in each of their pension plans were based on earnings and years of service or balances in individual accounts. Those whose benefits were based on earnings and years of service were classified as having a DB plan and those whose plans featured individual accounts were classified as having DC coverage.

As a validation exercise, we compared the coverage rates that resulted from our classification scheme with coverage rates from Form 5500 filings that private sector sponsors must file with the Department of Labor annually, and the results are shown in Table 1. Sponsoring firms report the number of participants by plan, thus people who participate in more than one plan are double counted. To facilitate the comparison we also double counted people with dual coverage in the CPS and SIPP data. The proportion of workers with defined benefit and defined contribution plans in the CPS and SIPP are remarkably similar to the proportions gleaned from the 5500 data suggesting that our classification scheme is sound.

As noted above, our premise is that changes in the composition of the labor force and changes in the nature of production have shifted pension coverage toward more

portable plans. Although our analysis is reduced form, we roughly divided up our variables into demand-side factors, related to the changing needs of individuals in the labor force, and supply-side factors related to changes in firm characteristics. On the demand side we believe that individuals who have lower attachment to the labor force or to a specific job will have a higher demand for a DC pension. As measures of potentially low labor market or job attachment we use variables on the proportion of individuals in a given industry who are women with children, part-time workers, part of a dual-earner couple, or have short job tenure. We would expect industries that have increased their shares of any of these types of workers to have been more likely to add DC pension coverage and reduce DB coverage. In addition we include a number of demographic variables to control for individual effects that may be correlated with pension coverage but which may not affect demand, such as age, sex, education and earnings in the prior year.

On the supply side, we expect that factors that reduce the benefits of long-term employment relationships will reduce the supply of DB pensions and increase the supply of DC pensions. As noted above, theory suggests that technical change is possibly one such factor. We measure technical change at the industry level as the growth in multifactor productivity between 1979 and 1998. Another way we capture the movement in some industries toward a more high-tech workplace is change in the proportion of individuals in the industry with professional and technical occupations.

An alternative explanation for the decline in DB pensions is that DB pensions are a means of rent-sharing, and a reduction in the ability of firms to pay such rents has reduced DB pension offerings. To capture these factors we use the average return to

capital by industry and the degree of unionization. We would expect that, perhaps because of economies of scale, large firms are more likely to offer pension coverage generally and DB coverage in particular, so changes in the distribution of firms within industries may also affect pension coverage.

We also include a number of variables to try to control for firm fixed effects and for changes over time that may be correlated with but not the cause of changes in pension coverage, including the change in the average industry wage, the change in the proportion of firms offering health plans, and the change in industry employment. In addition, over this period many firms were converting their DB plans to cash balance plans. Since the cash balance option may affect the introduction of both DB and DC plans we control for this using a variable on the number of cash balance plans in 1999 by industry, which was calculated by staff at the Department of Labor using data from 5500 filings.

Most of the demographic variables along with the variables on part-time status, professional and technical workers, unionization, firm size, tenure, and annual private wage and salary income were taken from the May CPS and the SIPP.[4] There were a few complications. First, the variables identifying whether an individual has children and whether they are part of a dual-earner couple were calculated using data obtained by matching individuals in the May CPS data with their previous survey responses in the March CPS.[5,6] Second, the SIPP does not have a variable for annual private wage and

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[4] The tenure variables were compared to those available in the January and February tenure supplements to the CPS as a quality check.

[5] The CPS is designed so that individuals are surveyed for four months in a row and the May pension supplement was only given to individuals who were part of the survey in March. However, not all individuals can be matched across the two months. In particular, individuals in the March survey would not have been interviewed in May if they changed residences. between the two surveys. In addition, individuals may simply not have responded to the survey in one of the two months. Finally, there is error

salary income comparable to that in the CPS, so one was created using the method in Coder and Scoon-Rogers (1996).

The remaining variables came from a few different sources. Data on employer-provided health insurance coverage and changes in industry employment were obtained from the full CPS March supplement sample. Industry weekly wages were obtained from the Outgoing Rotation Group files of the CPS. Data on industry multifactor productivity growth and the average return to capital were calculated from data in Harper and Gullickson (2002).

Results

To ascertain how supply and demand factors explain the decline in defined benefit pensions and the rise in defined contribution plans, we estimate equation 4 separately for the two types of pension plans. At the individual level, the equilibrium pension outcomes is a variable equal to 1 if an individual receives a given type of pension on their job. When we aggregate over all the individuals in an industry this variables becomes the proportion of individuals in the industry with the particular type of pension. We then

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in the matching process. In the 1979 survey, households have specific identifiers but individuals do not. Thus we matched individuals within households on their characteristics such as age, sex, and education. However, occasionally it is not possible to make a match. The May supplement file comes with the March information on wage and salary income already merged in, and we use this data to check the quality of the match we performed to add in the child variable. For instance, in 1979, 24,414 people answered the May supplement and of these 22,879 included March data. We were able to match 21,822 people from the May supplement to the March supplement and of these all but 7 had March private wage and salary income that matched the variables already on the May file. Individuals for whom this data did not match were eliminated from the sample.

[6] We calculated the number of children variable ourselves, because the existing child variables are not consistent across the CPS and SIPP. In the CPS, the variable refers only to the own children of the primary family. So for instance, a grandchild would not be counted at all even if the child's mother also lived in the house. In our variable, we allocate such children to the subfamily if they are part of one and to the primary family if they are not. For consistency, the same method was used to calculate number of children in the SIPP, although in that survey questions on own children in subfamilies could have been used to obtain a similar measure.

take the change in the proportion of workers with DB and DC coverage between 1998 and 1979 and estimate the resulting two equations, one for each pension type, at the two-digit industry level.

One question that arises with this approach is whether there is enough variation across industries, both with regard to the changes in pension offerings and also in terms of variation in our explanatory variables, to identify the model. Charts 2 and 3 graph the changes in DB and DC pension coverage for industries at the one-digit level. Industries underwent vastly different changes in their pension systems between 1979 and 1998.

While every industry experienced a decrease in the proportion of workers participating in DB pension plans and an increase in the proportion of workers participating in DC plans the range of change was significant. For instance, financial, insurance, and real estate services (FIRE) experienced a 35 percent decline in DB coverage, while wholesale and retail trade and mining experienced declines of a bit over 55 percent. The variation in DC pension increases was even greater, with the proportion of construction workers receiving DC pensions rising by only about 20 percent, while the proportion of Service workers with DC pension increased by 115 percent. Moreover, the industries with the largest declines in DB coverage did not necessarily add the most DC coverage. So for instance, FIRE, which, as we noted, had a relatively small decline in DB coverage doubled its DC coverage—one of the larger increases. Conversely, mining had one of the largest declines in DB coverage, yet was on the low-end of increases in DC coverage. The charts show the variation in coverage at the one-digit industry level for simplicity, however the variation in the change in coverage is greater at the two-digit industry level we use in our analysis.

Not only was there significant variation in pension coverage across industries, as Table 2 makes clear, there was also substantial dispersion in the change in industry characteristics (based on the 2-digit industries). A few specific examples illustrate the point. For example, the proportion of workers in dual-earner couples rose 24 percentage points on average between 1979 and 1998. But while some industries, such as personal services and leather and apparel manufacturers experienced hardly any increase, others, including many durable manufacturing industries experienced increases of around 35 percent. Moreover, while the proportion of workers with less than 5 years of experience barely increased on average across industries, auto repair services, education, and real estate all experienced increases in the proportion of low-tenure workers above 10 percentage points, while chemical manufacturers and the communications industry experienced increases of 15 percentage points or more.

Given the heterogeneity in industry pension coverage and characteristics, it seems that we should be able to identify some of the sources of shifting pension coverage. However, another concern in performing the estimation is whether unobserved changes in the characteristics of individuals or firms within industries are correlated with our explanatory variables, resulting in biased estimates. To determine whether this is a problem, we estimate the two equations jointly using both seemingly unrelated regression (SUR) and three-stage least squares (3SLS). Although we include a broad array of controls for individual characteristics, including earnings, education, race, and sex, in addition to our variables of interest, we can still imagine that individuals select themselves into firms and industries based on pension offerings. For instance, Ipollito (x) suggests that the propensity to save is correlated with work effort and so that pensions

help firms to select more productive workers. In contrast, it is more difficult to imagine a scenario underwhich changes in firm effects are correlated with our explanatory variables. We control for average industry productivity, whether it is a rising or declining industry, structural changes such as unionization and changes in the profit share. Moreover, we include the change in the proportion of firms offering health insurance, which is highly correlated with changes in pension offerings, and is likely to capture many unobserved firm characteristics that would affect both these factors. As a result, we are mostly concerned with the endogeneity of the demographic characteristics, including marital status, being part of a dual-earner couple, and being female with a child, and education. As instruments we use lagged changes in the demographic variables (the change from 1969 to 1978), since these variables likely capture long-run demographic changes but are predetermined. A Hausman test fails to reject the consistency of the SUR estimates at any level and so the following discussion focuses on the SUR estimates.

Table 3 shows the results of estimating equation 4 at the 2-digit industry level. As shown near the bottom of the table, the fit of the regression is remarkably good. The table presents the coefficients on the explanatory variables along with the standard errors. The results are basically in line with our predictions. On the demand side, a rise in the proportion of dual-earner couples, a rise in the proportion of women with children, and a rise in the proportion of workers with less than five years of experience statistically significantly decrease the proportion of workers in an industry who have defined benefit pension plans. Conversely, a rise in the proportion of married and dual-earner couples and an increase in the proportion of low-tenure workers increases the proportion of

workers in an industry who have defined contribution plans. These findings support the view that workers with relatively low job attachment have a higher demand for defined contribution plans and lower demand for defined benefit plans.

On the supply side, we find evidence that industries that have experienced greater technical change (measured by MFP growth and the change in the proportion of professional and technical workers) reduced their provision of defined benefits plans and increased their provision of defined contribution plans. Our results also support the idea that rent-sharing plays a role in the pension provision decision. Industries with greater increases in their average return to capital were more likely to increase their provision DB plans and reduce their provision of DC plans (although this latter effect is not statistically significantly).

In the current specification, the union variable is not statistically significant in either equation. Some researchers have suggested that the positive association between pensions and tenure is merely a result of the fact that jobs that provide pensions also provide other amenities, for instance, higher wages ceteris paribus. Our results refute this, since we find a correlation between declines in tenure and declines in DB coverage, conditional on the change in the average weekly wage in the industry and the average return to capital. The coefficient on the share of firms with greater than 100 employees is negative in the DB equation and positive in the DC equation, possibly indicating that some of the substitution toward DC plans occurred as a result of the sizable wave of mergers in the 1980s and the 1990s. The change in health care offering does not enter statistically significantly into either equation, suggesting that our independent variables well-explain changes in firms' decisions to offer benefits.

Another control variable of interest is the conversion of DB pension plans to cash balance plans. The factors driving cash balance conversions are likely to be similar to the factors leading to increased DC pension plans, since cash balance options also increase the portablility of pensions. In fact, we see that industries that experienced a greater increase in the number (proportion?) of workers covered by cash balance options also experienced large increases in DC plans. Although the cash balance variable is also positive in the DB equation, it is not statistically significant and it is economically unimportant.

While an examination of the coefficients suggests that both supply and demand factors have played an important role in explaining the shift from DB to DC pension plans, it does not provide much information about the magnitudes of the contributions. To provide a better understanding of the relative magnitudes of the various factors, as well as their overall effect. Charts 4 and 5 graph the impact, on DB and DC pension coverage respectively, of a one standard deviation change in some of our explanatory variables. Turning first to DB coverage, we see that a one standard deviation increase in the share of workers with less than five years of experience causes nearly a 6 percentage point decline in DB coverage. A one standard deviation increase in the share of women with children has a similar impact. Meanwhile a one standard deviation increase in the share of workers in dual-earner couples reduces DB coverage by about 2.5 percentage points. Overall the impact of these changing demographic characteristics (represented by blue bars), is a bit greater than the impact of changes in firm characteristics, represented by red bars. Among firm characteristics, the changes in technology are particularly important, with one standard deviation increase in either multifactor productivity growth

or the share of profession and technical workers both reducing DB pension coverage by 3.5 percentage points. A one standard deviation decline in the return to capital decreases DB pension coverage by 1.3 percentage points.

There is significant overlap between the variables associated with a decline in DB coverage and those associated with a rise in DC coverage, although there are some differences. As can be seen in Chart 5, one-standard deviation rise in the share of low-tenure workers increases DC coverage by 3.5 percent, while such an increase in the share of dual earners increases DC coverage by 2.5 percent. However, unlike the DB equation a change in the proportion of women with children was not statistically significant in the DC equations, while a change in the share of married workers was. A one standard deviation increase in the share of married workers (holding constant whether they are dual-earners) increased DC coverage by nearly 3.0 percent. On the firm side, the largest increase in DC coverage was due to a one standard deviation increase in the share of professional and technical, which increased coverage by 4.3 percent. A one standard deviation increase in the growth rate of multifactor productivity increased DC coverage by 2.4 percentage points. A decline in the average return to capital was not statistically significant in the DC equation and, as can be seen in Chart x, it is not economically important either.

CONCLUSION

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Table 1 – Pension Coverage Rates from the CPS and SIPP and Form 5500 Filings with the Department of Labor
(percent)

	CPS and SIPP	Form 5500
	1979	
DB	64.8	62.7
DC	35.2	37.3
	1998	
DB	32.2	31.4
DC	67.8	68.6

Table 2 –Selected industry characteristics at the 2-digit Industry Level
(Percentage point change 1998-1979)

Variable	Mean	Std. Dev.
Married workers	-7.2	6.4
Workers in dual-earner couples	23.9	11.6
Women with children	0.7	4.8
Professional and technical workers	4.0	5.3
Firms with 100+ workers.	-0.1	9.7
Average return to capital	-1.8	18.0
Workers with < five years of tenure	0.2	7.5
Memo: Growth in Multifactor productivity	7.8	24.3

Table 2 – Complete Regression Results for the Change in Pension Coverage 1998-1979

Dependent Variables: Change in Share of Workers Covered by a DB or DC Pension

Estimation Method: Seemingly Unrelated Regression estimated at 2-digit SIC Industry Level

Independent Variables: Measured as changes 1998-1979	Change in Defined Benefit Pension Coverage	Change in Defined Contribution Pension Coverage
Female	0.557 (0.116)	-0.046 (0.168)
Married	-0.113 (0.132)	0.453 (0.191)
Females with Children	-1.202 (0.162)	0.229 (0.235)
Dual Earners	-0.210 (0.057)	0.214 (0.083)
Part-Time Workers	0.242 (0.171)	0.111 (0.249)
Non-white	-0.899 (0.196)	0.567 (0.285)
Average age	-0.012 (0.005)	-0.001 (0.008)
High School Diploma	0.595 (0.117)	-0.505 (0.170)
Some College	0.562 (0.125)	-0.266 (0.181)
College	1.559 (0.310)	-1.521 (0.451)
>5 Years Tenure	-0.770 (0.155)	0.468 (0.225)
Individual Earnings in Prior Year	-0.018 (0.005)	0.003 (0.008)
Professional/Technical Workforce	-0.658 (0.158)	0.816 (0.230)
Average Industry Wage	0.224 (0.070)	0.139 (0.102)
Multi-factor Productivity Growth	-0.145 (0.019)	0.099 (0.027)
Unionization	0.118 (0.108)	0.189 (0.157)
Firms with >100 Employees	-0.278 (0.093)	0.550 (0.135)
Profit Margin	0.073 (0.021)	-0.035 (0.030)
Industry Employment	0.272 (0.670)	-1.023 (0.974)
Firms Offering Health Insurance	-0.115 (0.166)	-0.024 (0.241)
DB Plans that are Cash Balance	1.722 (1.484)	4.638 (2.157)
Constant	-0.060 (0.033)	0.073 (0.048)
R-squared	0.975	0.864
Number of Observations		39

* Also included but not presented here are a series of variables measuring the change in the share of aggregate employment across regions. These variables were individually and jointly significant.

Chart 1 - Private Sector Pension Coverage by Type

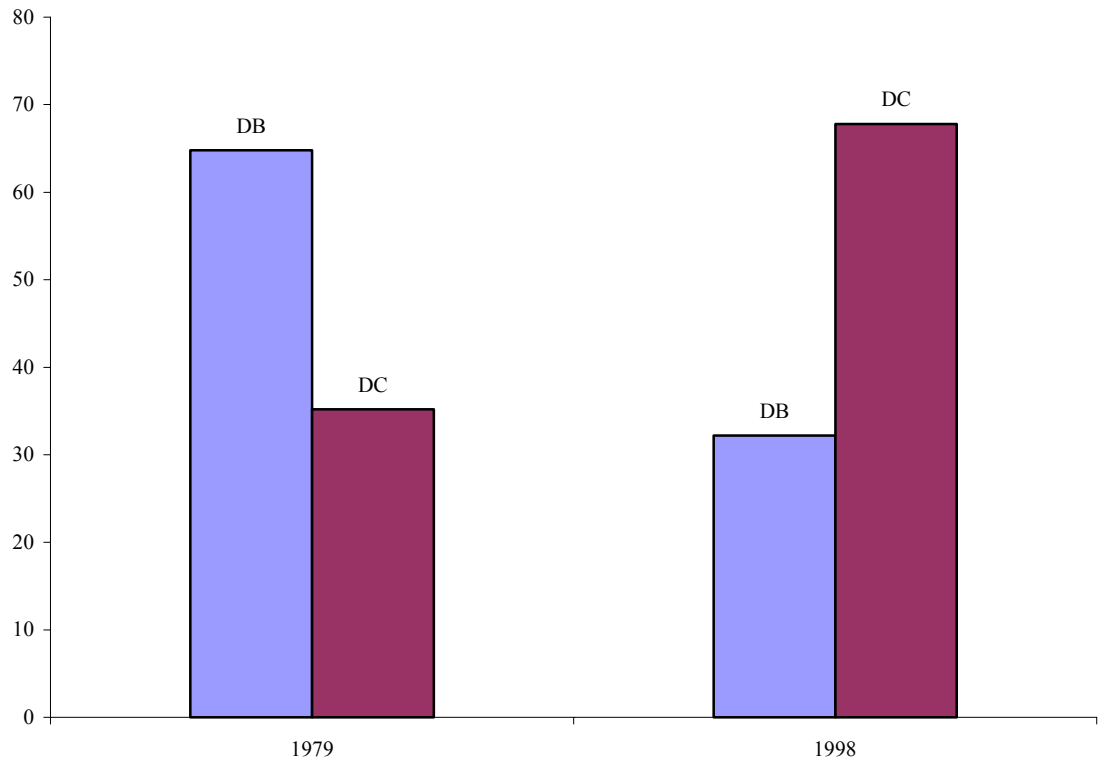


Chart 2 - Defined Benefit Pension Coverage by Industry

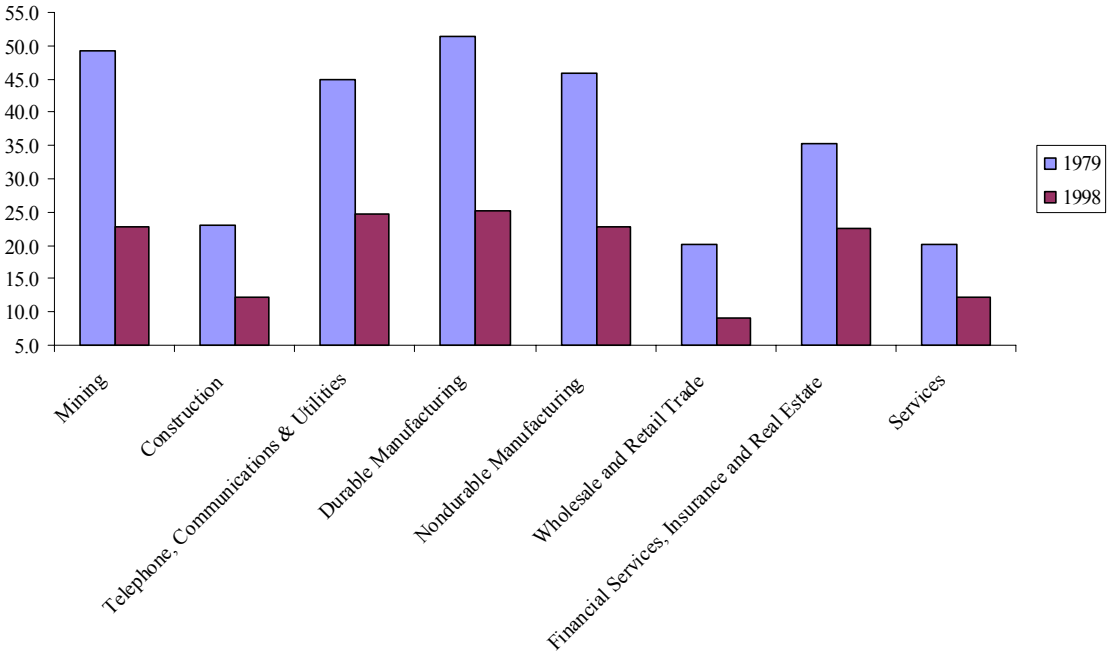


Chart 3 - Defined Contribution Pension Coverage by Industry

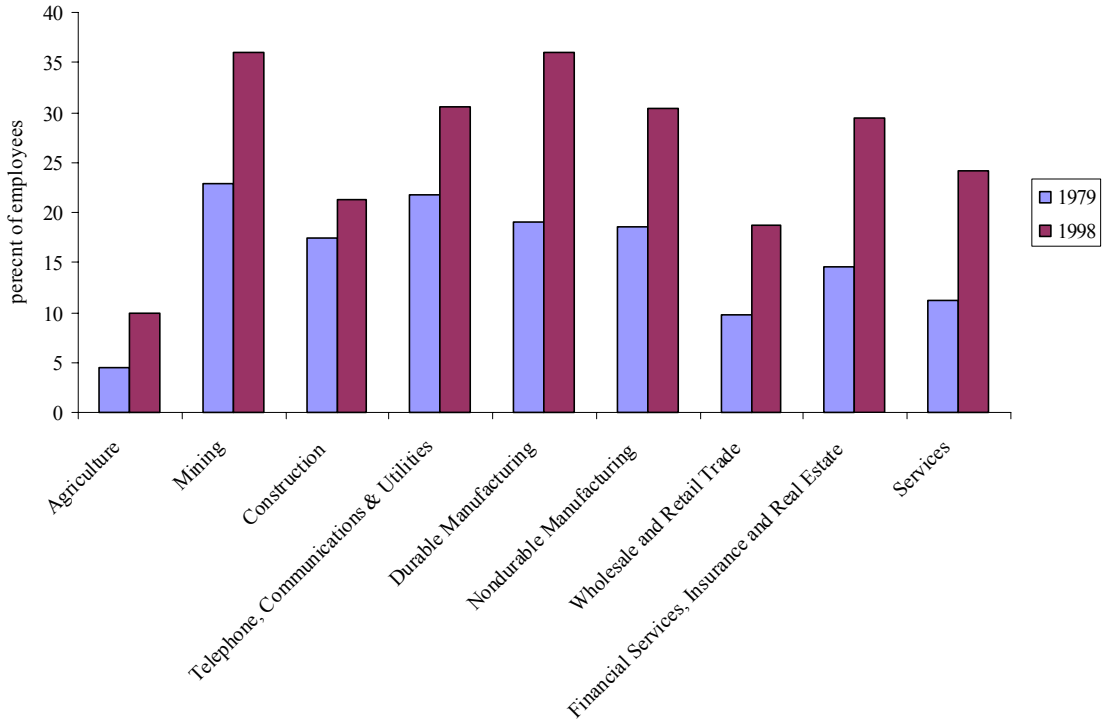
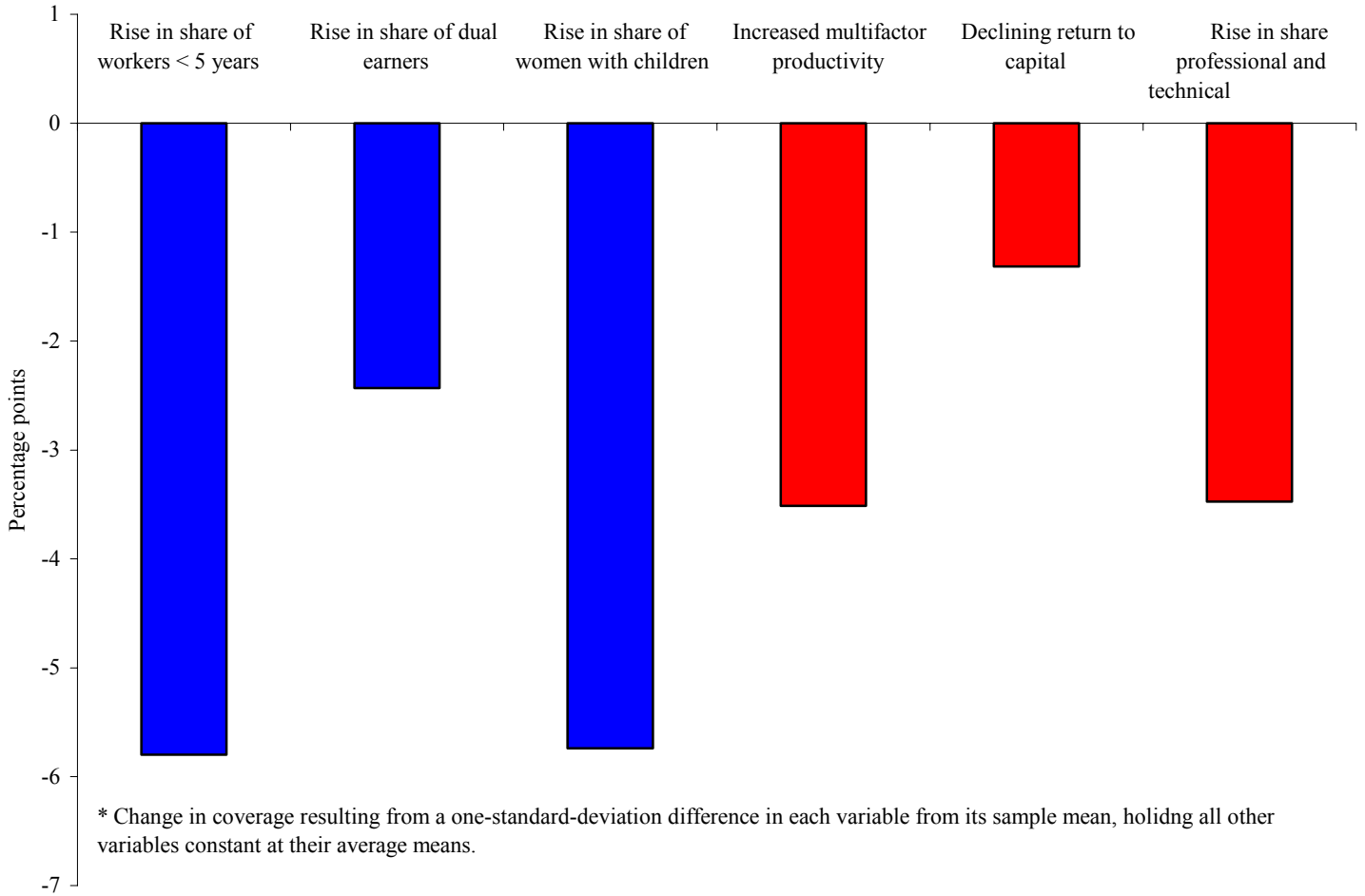
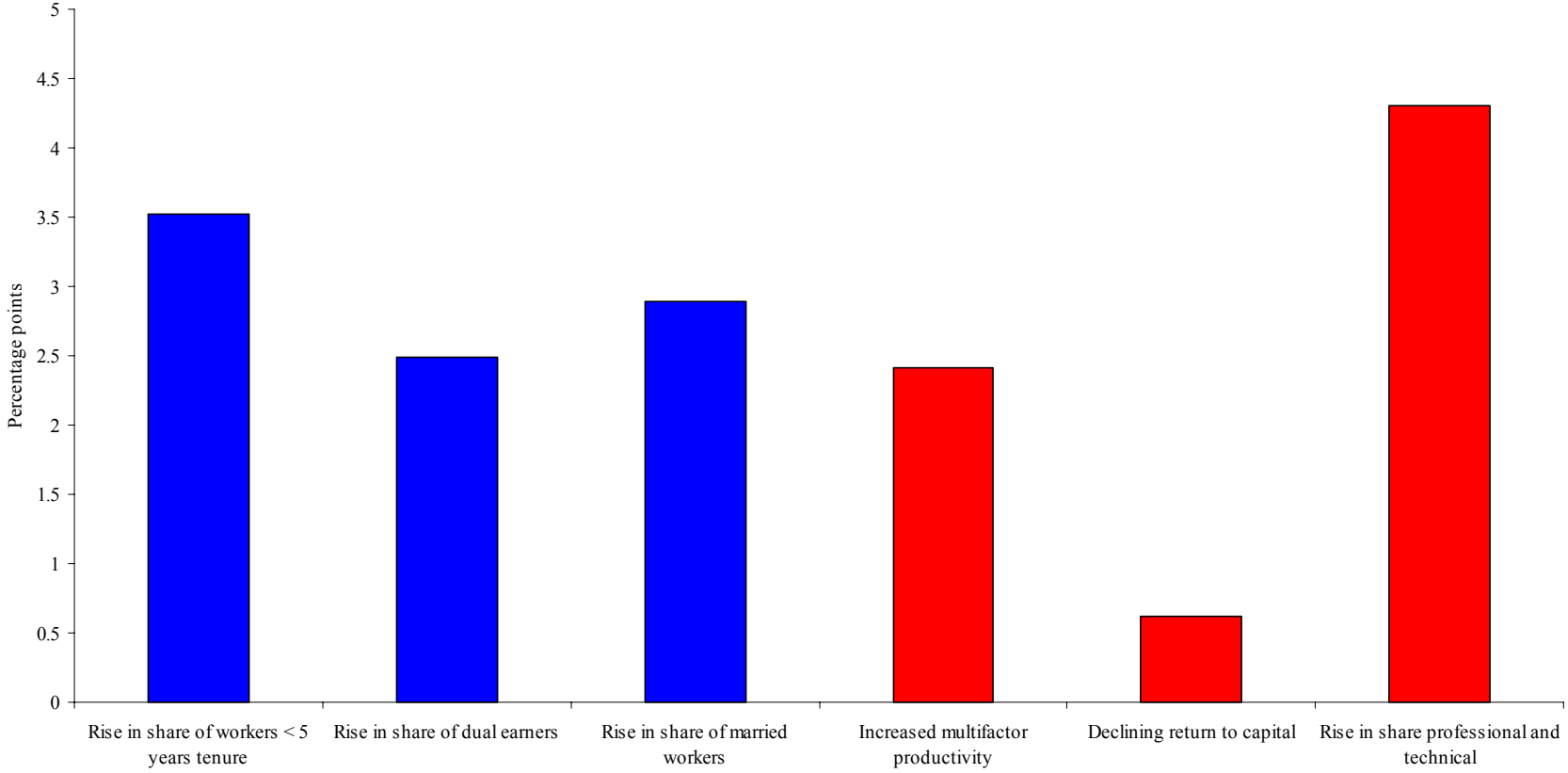


Chart 4 - Contributions of Economic Conditions to Rates of Decline in DB Coverage*



* Change in coverage resulting from a one-standard-deviation difference in each variable from its sample mean, holidng all other variables constant at their average means.

Chart 5 - Contributions of Economic Conditions to Rates of Increase in DC Coverage*



* Change in coverage resulting from a one-standard-deviation difference in each variable from its sample mean, holding all other variables constant at their average values.