An Analysis of the Substitution and Supplemental Effects Between 401(k) and Other Employers' Pension Plans

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Abstract: Using firm-level data from the Internal Revenue Service *Form 5500,* this paper provides new evidence of the substitution and supplemental effects between 401(k) plans and other employers' pension plans for longstanding firms. By comparing employers' pension plan choices between 1985 and 1996, we trace how individual employers changed their pension offerings during this study period. Multinomial logistic regression models were adopted to analyze the substitution and supplemental effects between 401(k) and other employers' pension plans. The empirical results do not support the hypothesis that the new 401(k) offerings were used to replace existing defined benefit (DB) plans, but rather replaced existing other defined contribution (DC) plans or supplement DB/other DC plans. [Key words: pension; defined benefit plans; defined contribution plans; 401(k) plans; substitution effect; supplement effect]

INTRODUCTION

Pension research has focused on various labor market incentives and other functions responding to employers' objectives and employees' needs. Most studies have concentrated on two major types of pension plans: defined benefit (DB) plans and defined contribution (DC) plans. DB plans specify the final retirement benefit, whereas DC plans make certain contributions each year. The final retirement benefits under DC plans

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depend on the investment performance of plan assets. Traditionally, DB plans have been used as a device for employers to sort workers, to increase productivity, to reduce quit rates at employees' early ages, and to encourage retirement at later ages.[1] On the other hand, DC plans offer better benefit portability,[2] encourage pre-tax savings, and provide investment choices for employees.

Since the early 1980s, the private pension system has been moving away from DB plans and toward DC plans because of changes in the nature of both the business environment and the labor market. The great decline in large manufacturing firms, the significant increase in small firms in the service industry, frequent corporate downsizing and restructuring, and changes in tax policies and regulations have altered both employers' and employees' preferences for pension plans. Since their establishment in 1978, 401(k) plans[3] have grown substantially and have become the most prevalent DC plans over the past fifteen years. The 401(k) plans differ from other DC plans in that employees are permitted to make voluntary pre-tax contributions for which employers offer matching contributions. Therefore, these plans offer more freedom for attaining desired savings beyond the employers' contribution. In addition, employers may also view 401(k) plans as an opportunity to reduce their pension costs, since participation is voluntary. Moreover, the matching feature of 401(k) plans permits firms to pay efficient wages exclusively to low discounters[4] (high-quality workers) who are more productive than high discounters.[5] In addition, recent pension findings have argued that 401(k) plans substitute for both DB and other DC plans and have speculated that the rapid growth of 401(k) plans is perhaps the most important reason to explain the recent trend toward DC plans.

Despite numerous debates on the issue of recent pension trends, the trend toward defined contribution plans has not been well-explored. The extant literature is unanimous in documenting the inverse relationship that can be observed between the net changes in the number of plans/participants in defined contribution plans and those in defined benefit plans. However, there is no universal agreement on the evidence of the termination of one and the creation of the other. Clark and McDermed (1990); Clark, McDermed, and Trawick (1993); Gustman, Mitchell, and Steinmeier (1992); Ippolito (1985, 1986, 1995, and 1998); and Kruse (1995) all attempted to measure the substitution effect between defined benefit and defined contribution plans by analyzing the net change in the number of plans and/or of participants. Researchers have also argued that 401(k) plans can substitute for both defined benefit and other defined contribution plans. Papke (1994, 1996) and Papke, Petersen, and Poterba (1996) examined whether sponsors of traditional defined benefit plans were replacing their

defined benefit plans with 401(k) plans or other defined contribution plans. Wang and VanDerhei (2000) have examined pension trends by the changing shares of primary plans, active participants, and employers' costs across plan types and firm types from 1985 to 1993. Their findings suggest that defined benefit plans have decreased about 20 percent for all three measurements from 1985 to 1993 and that defined contribution plans, in particular 401(k) plans, no longer prevail only as secondary plans.

Unfortunately, all of these studies share the following limitations. First, most of the studies that have investigated changes in the distributions of pension choices over time have treated the sponsorship of defined benefit, 401(k) or other defined contribution plans as a mutually exclusive decision. However, employers often offer more than one type of plan—one primary and the other supplemental. Thus, an employer's pension plan choice actually is not a selection from three types of plans but rather a selection from seven choices[6] of combinations of these three types of plans. Therefore, it is more appropriate to examine changes in the distributions of seven plan choices over time when investigating the issue of pension trends. Furthermore, in investigating the substitution effect between 401(k) and other pension plans, the earlier literature has treated 401(k) plans as an exogenous variable in their regression model. In reality, 401(k) plans provide an endogenous option for employers. Moreover, every year many old companies drop out of the market while many new companies enter. Owing to the differences in labor considerations, cost issues, and financial conditions, the behavior of employers' pension choices among these drop-out, longstanding,[7] and new firms may have significantly different patterns. Without controlling the drop-out and add-in sample, a direct comparison of data between two specific years may mislead any analysis of change in employers' pension choices.

The objective of this paper is to overcome the aforementioned problems and provide more precise evidence with regard to how 401(k) plans are used to replace or supplement other pension plans. We construct a sample of firms that sponsored at least one pension plan in 1985 and compare their pension plan choices between 1985 and 1996 to account for the substitution and supplementary effects between 401(k) and other employers' pension plans. This paper extends the previous work in a number of ways. First, by identifying 401(k) plans as a separate pension choice and treating them as an endogenous variable, we are able to provide the first new evidence regarding which employers would prefer 401(k) plans. Second, by classifying pension plan choices at both the primary and secondary levels, our analysis provides more precise information about the substitution and supplemental effects between 401(k) and other pension plans at both plan levels. Third, by controlling for the drop-out and new

firms, we provide more precise information about changes in employers' pension choices for longstanding firms.

The next section summarizes the existing evidence on pension trends in contributions to 401(k) and other employers' pension plans. Section III describes the data and methodology. Section IV presents the empirical evidence on the substitution and supplementary effects for 401(k) and other employers' pension plans. The final section concludes this paper.

TRENDS IN DEFINED BENEFIT AND DEFINED CONTRIBUTION PLANS

The present pension trend from defined benefit to defined contribution plans has been attributed, in varying degrees, to the increased regulation of defined benefit administrative costs, the shift in industry composition and employment, and the increased publicity about 401(k) plans. The relevant literature is discussed below.

One hypothesis that aims to explain employers' pension trends toward defined contribution plans is the increase in defined benefit administrative costs. Compared to defined benefit plans, defined contribution plans are subject to fewer regulations and have lower administrative costs since they need not meet an actuarial standard to ensure that the defined benefit will be provided in the future. Moreover, the Employee Retirement Income Security Act (ERISA) and subsequent tax and pension regulations passed in the mid-1980s have increased the relative costs of defined benefit plans and reduced their advantages. Clark and McDermed (1990) estimated a 15 percent decline in the number of firms that offered primary single-employer defined benefit plans from 1977 to 1985. Within this percentage, only about 3.1 percent can be explained by the shift in industry employment; the remaining 11.9 percent can be attributed to a shift in a firm's preference resulting from the increased regulation costs of defined benefit plans. Clark and McDermed updated their analysis (Clark, McDermed, and Trawick, 1993) by using data through 1988 to re-examine the pension trend issue. Their more recent results conclude that increasing regulations, rather than employment shift, accounted for most of the decline in DB plans from 1985 to 1988. Kruse (1995) found that the higher defined benefit administrative costs play a statistically significant role in the declining coverage of defined benefit plans in manufacturing companies, and new pension adopters in a less stable variety of employment industries are more likely to choose defined contribution plans. Using the data from the Hay Group and Pension Benefit Guaranty Corporation (hereafter PBGC), Hustead (1997) found that defined benefit plan costs grew much more

rapidly than defined contribution plan costs and exceeded defined contribution plan costs after 1985.

A second hypothesis for the pension trend involves the role of economic employment shift in the labor market. Over the past two decades, large unionized firms, which traditionally had high defined benefit coverage in the manufacturing industry, lost a significant portion of their employment to smaller, non-unionized firms in the service industry, where defined benefit plans traditionally had smaller market shares. Gustman, Mitchell, and Steinmeier (1992) found that at least half of the coverage changes over the period were due to employment shifts toward the firms that historically have had a lower probability of offering defined benefit plans. Ippolito (1995) found that about 6.4 percent of the 12.4 percent decline resulted from employment shifts.

Finally, the increased availability of 401(k) plans also plays a prominent role in explaining pension plan trends over the past two decades. Ippolito (1995) found that the growth in 401(k) plans over this period came at the expense of both defined benefit and defined contribution plans. Papke (1994) found that smaller sponsors reduced participation and funding and were more likely to indicate their intention to terminate defined benefit plans once 401(k) plans were introduced. Papke (1996) also found that the probability of offering a defined benefit plan was reduced when a sponsor introduced either a 401(k) or a defined contribution plan and that not all the assets in the new 401(k) plans represented net savings. In addition, she found that 401(k) and other defined contribution plans were substituted for terminated defined benefit plans and that offering a defined contribution plan of any type increased the probability of a defined benefit plan's termination. Papke, Petersen, and Poterba (1996) found that 401(k) plans typically did not replace but rather supplemented a pre-existing defined benefit plan or defined contribution plan.

DATA DESCRIPTION AND REGRESSION MODEL

The cross-sectional data from Internal Revenue Service *Form 5500* for 1985 and 1996[8] are used to examine employers' pension plan choices. The sample utilized in this paper includes only longstanding firms that existed in both 1985 and 1996. A number of tax and regulatory changes[9] during the early 1980s increased the administrative costs of defined benefit plans and thus encouraged employers to establish other defined contribution (ODC) or 401(k) plans or to terminate their existing defined benefit plans. In order to examine the impact of these regulations, the pre-regulatory 1985 data were chosen for sample comparison with the data for 1996.

The employers' pension plan choices were classified into seven categories as follows:

Category 1: firm with a DB plan only
Category 2: firm with an ODC plan only
Category 3: firm with a 401(k) plan only
Category 4: firm with both DB and ODC plans
Category 5: firm with both DB and 401(k) plans
Category 6: firm with both ODC and 401(k) plans
Category 7: firm with DB, ODC, and 401(k) plans.

Multinomial Logistic Regression Model

To further analyze the substitution and supplementary effects among different types of pension plans at both primary and secondary plan levels, the multinomial logistic regression models were constructed. Suppose firm i at time t has J plans to choose from. Let y^*_{jit} be the unobservable "utility" of choosing the jth plan, which is specified as a linear regression model:

$$y^*_{jit} = \beta'_j x_{it} + u_{jit}, \quad j = 1,\ldots, J, \tag{1}$$

where x_{it} is a vector of explanatory variables,
u_{jit} is the random disturbance, and
β_j are the plan-specific parameters to be estimated.

Firm i chooses the jth plan if $y^*_{jit} > y^*_{kit}$, for all $k \neq j$. It is straightforward to show that the probability for firm i at time t to choose the jth plan is

$$P_{it}(j) = \frac{\exp(\beta'_j x_{it})}{\sum_{k=1}^{J} \exp(\beta'_k x_{it})} \tag{2}$$

The Primary Plan Substitution

To analyze the substitution effects among different types of primary plans, the dependent variable is classified into three alternatives: the primary DB plan, the primary ODC plan, and the primary 401(k) plan. In this analysis, two multinomial logistic models are employed. They are used to examine changes in the primary pension choice for firms with only DB plans[10] and for firms with only other DC plans,[11] respectively, in 1985. For our estimation we include five groups of variables that have been most

successful in predicting a firm's choice from labor-market incentives.[12] These variables are described in detail as follows:

1. Firm Size Effect (Bsize): a dummy to indicate large firm or small firm. It is equal to one if the number of employees in the firm is greater than 1,000. Kotlikoff and Smith (1983) suggested that larger firms are more inclined to choose a DB plan. Twinney (1997) stated that larger firms prefer a DB plan as the primary plan because of cost efficiency rather than the effectiveness of using this type of plan to achieve an employer's desired objectives.

2. Industry Dummies: this group of dummies distinguishes seven types of industries—the manufacturing industry which is the comparison base; the agriculture and mining industry (AGRI); the construction industry (CONST); the transportation industry (TRANS); the trading industry (TRADE); the finance, insurance, and real estate industry (FIRE); and the service industry (SERVICE). Gustman, Mitchell, and Steinmeier (1992) and Ippolito (1995) proposed that, because of differences in labor-market incentives, manufacturing firms may favor DB plans,[13] whereas firms in the service industry may favor DC plans.[14]

3. Union Effect (Union): a dummy to indicate whether the firm is unionized. It is equal to one if the firm is unionized. Kotlikoff and Smith (1983) and Ippolito (1995) pointed out that employees could often bargain for better pension benefits through a union. As a result, we often observe that a unionized firm is more likely to choose a DB plan.

4. Downsizing Effect (DSIZE): A dummy to indicate whether the number of employees in the firm decreased from 1985 to 1996. It equals one if the difference in firm size between 1985 and 1996 is negative.

5. Change in Union Status (CUNION)[15]: A dummy to indicate whether the firm ever changed its union status between 1985 and 1996. It is equal to one if the firm changed its union status.

Substitution and Supplemental Effects in the Secondary Plans

To analyze the substitution and supplemental effects among different types of pension plans in secondary plans, two multinomial logistic models are employed. The first model examines the decision changes for firms with only DB plans in 1985. The dependent variable of the first model consists of four alternatives, including DB as the primary plan without any supplementary plan and DB as the primary plan, which is supplemented, respectively, by the other DC plan, by the 401(k) plan, and by both the other DC

Table 1. Termination, Substitution, and Supplemental Activities for Firms Existing in Both 1985 and 1996

Firm's Pension Choice in 1985	No Change	Term* DB	Term* ODC	Term * 401(k)	401(k) Sub** DB	401(k) Sub** ODC	401(k) Sup*** DB/ ODC	Others
DB Only	25.29%	0.00%	0.00%	0.00%	8.04%	0.00%	17.58%	49.09%
ODC Only	56.04%	0.00%	0.00%	0.00%	0.00%	30.25%	10.95%	2.76%
401(k) Only	52.77%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	47.23%
DB + ODC	13.44%	25.78%	5.81%	0.00%	11.33%	21.64%	12.35%	9.66%
DB + 401(k)	39.75%	10.21%	0.00%	4.66%	0.00%	0.00%	0.00%	45.39%
ODC + 401(k)	28.13%	0.00%	31.48%	32.87%	0.00%	0.00%	0.00%	7.52%
DB + ODC + 401(k)	26.25%	10.94%	32.19%	10.94%	0.00%	0.00%	0.00%	19.69%
Total	36.99%	4.17%	3.09%	1.86%	3.98%	11.56%	10.72%	27.64%

*Term = terminated **Sub = substituted ***Sup = supplemented

and the 401(k) plans. The comparison base is the DB plan without any supplementary plans, which represents no change of employers' pension choice. The second model examines the decision changes for firms with both DB and other DC plans in 1985. The dependent variable of the second model consists of three alternatives: DB as the primary plan, which is supplemented, respectively, by the other DC plan, by the 401(k) plan, and by both the other DC and the 401(k) plans. The comparison base is the DB plan supplemented by the other DC plan. By analyzing these changes in employers' pension plan choices between 1985 and 1996, we are able to identify the substitution and supplemental effects among different types of pension plans. The explanatory variables are the same as those specified in the previous section.

EMPIRICAL FINDINGS

Substitution and Supplemental Activities for All Firms Existing in 1985 and 1996

Table 1 summarizes the most important revision activities for firms existing in both 1985 to 1996. In addition, Tables A1–A1 in the appendix provide details of all the revision activities.

For all firms existing in both 1985 and 1996, 36.99 percent did not change their pension plan choices, 11.56 percent replaced existing other DC plans with 401(k) plans, 10.72 percent adopted 401(k) plans to supplement existing DB or other DC plans, 4.17 percent terminated existing DB plans, and only 3.98 percent replaced existing DB plans with 401(k) plans. According to Table 1, the most significant revision activities occurred in firms with pension plan choices DB + ODC in 1985. Among these firms, the percentage showing no change was only 13.44 percent. To provide greater insight, the activities are further described as follows:

1. For firms with DB and other DC plans in 1985: only 13.44 percent did not change their pension plan choices, 25.78 percent terminated existing DB plans, 21.64 percent replaced existing other DC plans with 401(k) plans, and 12.35 percent adopted 401(k) plans to supplement existing DB and other DC plans.

2. For firms with DB plans only in 1985: only 25.29 percent did not change their pension plan choices, and 17.58 percent adopted 401(k) plans to supplement existing DB and other DC plans.

3. For firms with other DC and 401(k) plans in 1985: only 28.13 percent did not change their pension plan choices, 32.87 percent terminated existing 401(k) plans, and 31.48 percent terminated existing other DC plans.

4. For firms with DB, other DC, and 401(k) plans in 1985: only 26.25 percent did not change their pension plan choices, 32.19 percent terminated existing other DC plans, 10.94 percent terminated existing 401(k) plans, and 10.94 percent terminated existing DB plans.

Revision Activities by New Adoption of 401(k) Plans

To investigate further the substitution and supplemental effects between 401(k) and DB/other DC plans, the sample is classified into two groups as follows:

1. Firms adopting new 401(k) plans from 1985 to 1996.

2. Firms not adopting new 401(k) plans from 1985 to 1996.

Table 2 reports the most important revision activities in the first group.

The empirical results do not support the hypothesis that new 401(k) plans are used to replace existing DB plans, but rather indicate that they replace other existing DC plans or supplement DB/other DC plans. Overall, for firms adopting new 401(k)s plans between 1985 to 1996, 38.14 percent replaced existing other DC plans with 401(k) plans, 35.84 percent

Table 2. Termination, Substitution, and Supplemental Activities for Firms Adopting New 401(k) Plans from 1985 to 1996

Firm Choice in 1985	401(k) Sub DB	401(k) Sub ODC	401(k) Sup DB	401(k) Sup ODC
DB only	24.17%	0.00%	52.87%	0.00%
ODC only	0.00%	71.23%	0.00%	26.86%
401(k) only	0.00%	0.00%	0.00%	0.00%
DB + ODC	20.61%	39.37%	22.46%	0.00%
DB + 401(k)	0.00%	0.00%	0.00%	0.00%
ODC + 401(k)	0.00%	0.00%	0.00%	0.00%
DB + ODC + 401(k)	0.00%	0.00%	0.00%	0.00%
Total	13.12%	38.14%	35.84%	

adopted 401(k) plans to supplement existing DB or other DC plans, and only 13.12 percent replaced existing DB plans with 401(k) plans. From Table 2, we find that more than half (52.9 percent) of the firms with only DB plans in 1985 adopted new 401(k) plans to supplement existing DB plans, and about 24.2 percent of these firms substituted 401(k) plans for existing DB plans from 1985 to 1996. In addition, nearly three-quarters (71.23 percent) of the firms with other DC plans only in 1985 substituted 401(k) plans for existing other DC plans during this period. Moreover, 39.4 percent of the firms offering DB + ODC plans in 1985 substituted 401(k) plans for existing other DC plans, and 20.6 percent of these firms substituted 401(k) plans for existing DB plans during this period.

Multinomial Logistic Regression Results

Table 3 reports the multinomial logistic regression results for substitution effect in the primary plans for firms with primary DB plans in 1985.

For the substitution effect in the primary plans for firms with primary DB plans in 1985, we find that larger firms and unionized firms were more reluctant to change their primary DB plans. Moreover, the change in union status did not have any influence in the change of employers' primary pension plan choices. Downsizing firms were more likely to replace existing primary DB plans with other DC plans. As for the substitution effect by industry, we find that, compared to the manufacturing industry, the service, finance-related, and agriculture industries were less inclined to change primary plans from DB plans to 401(k) plans, whereas the trade

Table 3. Multinomial Logistic Regression Results for Substitution Effect in Primary Plans for Firms with Primary DB Plans in 1985

Variables	**401(k)** Estimated Coefficient	Chi-Square	**ODC** Estimated Coefficient	Chi-Square
INTERCEPT	–0.625***	38.00	–2.102***	239.35
BSIZE	–0.930***	78.54	–0.568***	27.11
DSIZE	0.023	0.05	0.865***	59.70
SERVICE	–1.118***	54.81	1.138***	82.31
FIRE	–1.180***	49.93	–0.245	1.89
TRADE	0.324**	5.21	0.175	0.75
TRANS	–0.390*	3.46	0.037	0.03
CONST	0.722**	4.91	0.730*	2.98
AGRI	–0.955***	8.36	–0.037	0.01
UNION96	–2.031***	117.30	–1.241***	55.27

Base: primary DB, representing no change in pension choice.
Second alternative: primary ODC plans, representing the substitution effect of ODC plans for DB plans.
Third alternative: primary 401(k) plans, representing the substitution effect of 401(k) plans for DB plans.
*** Significant at the 1 percent level
** Significant at the 5 percent level
* Significant at the 10 percent level

and construction industries were more likely to do so. But we are surprised to find that the service industry was more likely than the manufacturing industry to change from DB plans to other DC plans. This result seems to contradict the previous findings in the literature. Gustman, Mitchell, and Steinmeier (1992) and Ippolito (1995) suggested that firms in the manufacturing industry were more likely to choose DB plans because of labor-market insensitivity. The sample utilized in Gustman, Mitchell, and Steinmeier (1992) and Ippolito (1995) included all firms, whereas the sample utilized in this paper includes only longstanding firms. Thus, facing huge pension liabilities,[16] longstanding firms in the manufacturing industry might be more likely to change their choice of primary DB plans to other DC plans for reasons of survival.

Table 4. Multinomial Logistic Regression Results for Substitution Effect in Primary Plans for Firms with Primary Other DC Plans in 1985

Variables	**401(k)** Estimated Coefficient	Chi-Square	**DB** Estimated Coefficient	Chi-Square
INTERCEPT	1.199***	94.00	–3.998***	190.93
BSIZE	–1.598***	118.16	2.319***	88.66
DSIZE	1.155***	74.87	–0.129	2.05
SERVICE	0.722***	16.95	–0.521	2.60
FIRE	–0.797***	12.52	0.868***	6.37
TRADE	0.319**	4.07	–0.420	1.72
TRANS	–0.044	0.02	0.724**	3.44
CONST	0.061	0.05	–0.690	1.18
AGRI	0.647	2.46	0.313	0.28
UNION96	–0.884*	3.83	2.13***	35.24
CUNION	–0.214	0.16	–0.507	1.36

Base: primary ODC plan, representing no change in pension choice.
Second alternative: primary 401(k) plans, representing the substitution effect of 401(k) for ODC plans.
Third alternative: primary DB plans, representing the substitution effect of DB plans for ODC plans.
*** Significant at the 1 percent level
** Significant at the 5 percent level
* Significant at the 10 percent level

Table 4 reports the multinomial logistic regression results for substitution effect in the primary plans for firms with primary other DC plans in 1985.

For the substitution effect in the primary plans for firms with primary other DC plans in 1985, we find that larger firms and unionized firms were more likely to change their primary plans to DB plans but more reluctant to change their primary plans to 401(k) plans. As we found in the previous section, a change in union status did not have any influence on the change in employers' primary pension plan choices. Downsizing firms were more likely to replace existing primary other DC plans with 401(k) plans. As for the substitution effect by industry, we find that, compared to the manufacturing industry, the service and trade industries were more inclined to

Table 5. Multinomial Logistic Regression Results for Substitution and Supplemental Effects for Firms with DB Plans Only in 1985

Variables	DB + ODC Estimated Coefficient	DB + 401(k) Estimated Coefficient	DB, ODC, and 401(k) Estimated Coefficient
INTERCEPT	2.036***	0.279	2.540***
BSIZE	1.081***	0.661**	0.002
DSIZE	0.099	–0.648**	–1.388***
SERVICE	1.774***	2.503***	–1.067***
FIRE	0.121	–0.084	0.269
TRADE	1.053*	1.026*	0.836
TRANS	1.593***	0.973	0.884
CONST	0.383	–8.281	0.679
AGRI	0.213	–0.654	–0.473
UNION96	0.767***	0.994***	0.757***
CUNION	0.636*	0.675	0.763**

Base: DB, representing no change in pension choice.
Second alternative: DB and ODC plans, representing the supplemental effect of ODC plans.
Third alternative: DB and 401(k) plans, representing the supplemental effect of 401(k) plans.
Fourth alternative: DB, ODC, and 401(k) plans, representing the supplemental effect of ODC and 401(k) plans.
*** Significant at the 1 percent level
** Significant at the 5 percent level
* Significant at the 10 percent level

change primary plans from other DC plans to 401(k) plans, whereas the finance-related industries were less likely to do so.

Table 5 and Table 6 report the multinomial logistic regression results for substitution and supplemental effects in the secondary plans for firms with only DB plans and for firms with both DB and other DC, respectively, plans in 1985.

We find that larger firms and unionized firms were more likely to offer 401(k) or other DC plans to supplement their primary DB plans, while

Table 6. Multinomial Logistic Regression Results for Substitution and Supplemental Effects for Firms with Both DB and ODC Plans in 1985

Variables	DB + 401(k) Estimated Coefficient	Chi-Square	DB, ODC, and 401(k) Estimated Coefficient	Chi-Square
INTERCEPT	0.588*	3.04	1.116***	14.07
BSIZE	–1.325***	29.60	–0.149	0.41
DSIZE	0.498*	3.54	0.001	0.00
SERVICE	–0.884**	4.17	–0.786*	3.12
FIRE	0.225	0.43	–0.154	0.28
TRADE	0.083	0.04	–0.205	0.33
TRANS	0.596	1.83	0.544	2.09
CONST	–0.079	0.01	–1.317	1.98
AGRI	0.783	0.75	1.370*	3.08
UNION96	–0.710**	5.78	1.105***	18.17
CUNION	–0.030	0.00	0.179	0.19

Base: DB and ODC plans, representing no change in pension choice.
Second alternative: DB and 401(k) plans, representing the substitution effect of 401(k) plans for ODC plans.
Third alternative: DB, ODC, and 401(k) plans, representing the supplemental effect of 401(k) plans.
*** Significant at the 1 percent level
** Significant at the 5 percent level
* Significant at the 10 percent level

downsizing firms were more reluctant to do so. We also find that, compared to firms in the manufacturing industry, firms in the service industry were more likely to offer 401(k) or other DC plans but less likely to offer both 401(k) and other DC plans to supplement their primary DB plans.

For the substitution and supplemental effects in the secondary plans for firms with both DB and other DC plans in 1985, we find that larger firms and unionized firms were less likely to replace their existing other DC plans with 401(k) plans, whereas downsizing firms were more likely to do so. One possible explanation for unionized firms not to prefer 401(k) plans is that, compared to other DC plans, the employers' contribution under 401(k) plans is more uncertain. Moreover, we note that firms in the manufacturing industry were more likely than those in the service industry to replace their existing other DC plans with 401(k) plans. Our explanation of

this finding is that providing 401(k) plans in manufacturing firms is cheaper than in the service industry.[17] In addition, unionized firms and firms in the service industry were more likely to supplement 401(k) plans for their existing DB and other DC plans, whereas firms in the agriculture industry were more reluctant to do so.

CONCLUSION AND POLICY IMPLICATIONS

How can the growth of 401(k) plans and the decline of defined benefit and other defined contribution plans be explained? By identifying 401(k) plans as a separate pension choice and treating them as an endogenous variable, we are able to provide the first new evidence regarding what kinds of employers would prefer 401(k) plans for longstanding firms. In addition, by classifying pension plan choice at both the primary and secondary levels, our analysis provides more precise information about the substitution and supplemental effects between 401(k) and other pension plans at both plan levels.

The primary findings of this paper can be summarized as follows:

The empirical results do not support the hypothesis that new 401(k) plan offerings are used to replace existing DB plans, but rather to replace existing other DC plans or to supplement DB/other DC plans for longstanding firms. For longstanding firms adopting any new 401(k) plans between 1985 and 1996, 38.14 percent replaced existing other DC plans with 401(k) plans, 35.84 percent adopted 401(k) plans to supplement existing DB or other DC plans, and only 13.12 percent replaced existing DB plans with 401(k) plans. Our results confirm the findings of Papke, Petersen, and Poterba (1996). However, it is worth noting that we provide much more precise information regarding this revolution at both plan levels. We find that more 401(k) plans are used to replace existing primary other DC plans than to supplement DB/other DC plans at the secondary plan level.[18]

With regard to the substitution effect in the primary plans, in general we find that industry, firm size, and union status are important factors that drive employers of longstanding firms to change their pension choices. As in the earlier literature, we observe that large and unionized firms are more reluctant to change their primary DB to 401(k)/other DC plans or to change their primary other DC plans to 401(k) plans. Moreover, this paper finds that the change in union status seems to have no influence on changes in employers' primary pension plan choices. In addition, for cost-reduction reasons, downsizing firms are more likely to substitute other DC plans for their existing primary DB plans or to substitute 401(k) plans for their existing primary other DC plans. As for the substitution effect by industry,

we find that, compared to the manufacturing industry, the service, finance-related, and agriculture industries are less inclined to change their primary plans from DB plans to 401(k) plans, while the trade and construction industries are more likely to do so. However, contrary to the previous findings, we find that the service industry is more likely than the manufacturing industry to change from DB plans to other DC plans. Our findings imply that, for survival reasons, cost reductions, as opposed to labor-economics considerations, are more important factors in employers' primary pension decisions for longstanding firms.

For the substitution and supplemental effects in the secondary plans, as in the earlier research, we find that large unionized firms were more likely to supplement their primary DB plans with as many secondary plans as possible, but they were less likely to replace their existing other DC plans with 401(k) plans. One possible explanation is that unionized firms do not prefer 401(k) plans because of the uncertain matching of employers' contributions, which may possibly result in a lower retirement income. It is also worth noting that firms in the manufacturing industry were more likely than those in service industry to replace their existing other DC plans with 401(k) plans because of cost considerations, since providing 401(k) plans is cheaper in manufacturing firms than in the service industry.

Our empirical results imply that most of the new 401(k) plan offerings are used to replace existing other primary DC plans rather than primary DB plans. This finding implies that future retirement income under DC plans may become more uncertain since the employers' pension contributions depend on the matching rates in 401(k) plans. In particular, for some groups of workers—such as women and low-income workers—the low saving behavior and conservative investment strategies[19] will introduce greater risk of insufficient retirement income for these workers. In addition, our results seem to suggest that when considering future Social Security reform options, policy makers should favor two-tiered settings (DB + DC) instead of simply privatizing the entire Social Security system, since the forced savings incentive is much lower under 401(k) plans than under other DC plans.[20] More importantly, future policy makers should focus on improving pension income security by considering the potential for DC plans, in particular 401(k) plans, to serve as a "primary pension income vehicle" rather than a "secondary plan setting" to supplement primary DB plans. On the other hand, judging from the change patterns of pension plan decisions, employers in longstanding firms seem to prefer a hybrid type (DB + DC) of pension choice, which appears to offer better protection for different kinds of retirement risks.[21]

NOTES

[1] Ippolito (1985) argued that a firm may use a DB plan to turn workers into bondholders of the firm to retain experienced workers by implicitly paying workers above their marginal product in later work periods in exchange for paying them less in early periods. For other related issues, see also Lazear (1985) and Gustman and Steinmeier (1987).

[2] Compared to DC plans, DB plans are considered to have lesser portability because a worker in a DB plan may suffer a portability loss resulting from changing jobs or being laid off (see Hay/Huggins, 1988).

[3] The 401(k) plan is also known as Cash or Deferred Arrangements (CODA) plan and is classified as a defined contribution plan.

[4] Low discounters attach approximately equal values to future and present consumption, whereas high discounters attach disproportionate values to current consumption and tend to discount pensions heavily in comparison to cash wages.

[5] If productivity and internal discount rates are critically related and monitoring is not free, then the matching feature of 401(k) plans can efficiently sort out the high discounters (low-quality workers) and motivate the low discounters (high-quality workers) to remain without incurring additional monitoring resources. For further details, see Ippolito (1995, 1998).

[6] The employers' pension plan choices are classified into seven categories for each firm: (1) defined benefit plan only, (2) defined contribution plan only, (3) 401(k) plan only, (4) defined benefit and defined contribution plans, (5) defined benefit and 401(k) plans, (6) defined contribution and 401(k) plans, and (7) defined benefit, defined contribution, and 401(k) plans.

[7] Longstanding firms refer to the enduring firms that remained in the market from 1985 to 1996. On the other hand, dropout firms refer to the firms that dropped out of the market between 1986 and 1996, whereas new firms refer to the firms that were established between 1986 and 1996.

[8] This study does not use the data between 1985 and 1996. The direct comparison of two cross-sectional year data may limit the possibility of the dynamic analysis in order to test how sensitive firms are in making their decisions on switching plans. For a related analysis, see Wang, Chung, and Tzeng (2001).

[9] The Tax Reform Act of 1986 (TRA86) imposed an excise tax of 10 percent on excess pension assets that reverted to an employer upon termination of its pension plan. Subsequent legislation raised this tax to 20 percent, effective in 1990, and to 50 percent if the employer does not transfer a portion of the excess assets to a replacement plan or increase benefits under the terminated plan. The Omnibus Budget Reconciliation Act (OBRA) of 1987 shortened various amortization periods and restricted the tax deductibility of plan contributions to no more than 150 percent of the plan's termination liability. It also increased the basic PBGC premium rate from $8.50 to $16.00 per participant and added an additional variable premium that depends on the plan's degree of underfunding.

[10] In 1985, firms with only DB plans made up 34.44 percent of the entire population of long-standing firms.

[11] In 1985, firms with only DC plans made up 30.58 percent of the entire population of long-standing firms.

[12] See Clark (1989), Dorsey (1987), and Luzadis and Mitchell (1988).

[13] From the labor-market perspective, firms in the manufacturing industry were more likely to adopt DB plans because these plans could be used as a device for employers to increase productivity and to reduce quit rates at employees' early ages.

[14] From the labor-market perspective, firms in the service-related industry were more likely to adopt DC plans because these plans offer better portability for workers and require fewer administration costs for employers.

[15] The union status has been used as the proxy to represent employee influence on employers' pension choice decisions. However, owing to a lack of suitable individual data, I was unable to incorporate any variables other than union status and change in union status into the empirical models. The influence of the employees' composition for employer pension choice is very important in the pension literature and certainly deserves more investigation for future research.

[16] By comparing the pension benefit per person of DB plans in 1985, we find that the pension benefit per person of DB plans in the manufacturing industry was $6,790, almost twice as great as that ($3,400) in the service industry.

[17] The average matching rate in the manufacturing industry is 0.86, which is much lower than the 1.35 in the service industry.

[18] From Table 2, for firms adopting any new 401(k) plans between 1985 to 1996, 38.14 percent substituted 401(k) plans for existing DC plans. Among this particular group, nearly three-quarters (71.23 percent) substituted 401(k) plans for existing DC plans during this period.

[19] Bajtelsmit and VanDerhei (1997) showed that the individual pension investment allocation decision is consistent with an assumption of decreasing relative risk aversion and that women tend to be more likely to invest in fixed-income securities.

[20] Engen, Gale, and Scholz (1996) found little or no savings effects in 401(k) plans and concluded that 401(k) contributions do not raise new net savings. For related discussion, see Poterba, Venti, and Wise (1996) and Hubbard and Skinner (1996).

[21] See Mitchell, Gordon, and Twinney (1997).

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APPENDIX

Table A1. Employers' Pension Plan Choices in Both 1985 and 1996, by Number of Firms

Firm Choice in 1996/in 1985	DB only	ODC only	401(k) only	DB + ODC	DB + 401(k)	ODC+ 401(k)	DB + ODC+ 401(k)	Total	%
DB only	1126	1477	358	369	649	340	134	4453	34.44
ODC only	23	2216	1196	36	32	433	18	3954	30.58
401(k) only	11	331	543	12	46	76	10	1029	7.96
DB + ODC	80	355	133	185	298	156	170	1377	10.65
DB + 401(k)	52	166	114	105	444	139	97	1117	8.64
ODC + 401(k)	3	118	113	3	10	101	11	359	2.78
DB + ODC + 401(k)	16	75	35	70	206	70	168	640	4.95
Total	1311	4738	2492	780	1685	1315	608	12929	100.00

Table A2. Employers' Pension Plan Choices in Both 1985 and 1996, by Percentage of Firms

Firm Choice in 1996/in 1985	DB only	ODC only	401(k) only	DB + ODC	DB + 401(k)	ODC + 401(k)	DB + ODC + 401(k)	Total
DB only	25.29%	33.17%	8.04%	8.29%	14.57%	7.64%	3.01%	100.00%
ODC only	0.58%	56.04%	30.25%	0.91%	0.81%	10.95%	0.46%	100.00%
401(k) only	1.07%	32.17%	52.77%	1.17%	4.47%	7.39%	0.97%	100.00%
DB + ODC	5.81%	25.78%	9.66%	13.44%	21.64%	11.33%	12.35%	100.00%
DB + 401(k)	4.66%	14.86%	10.21%	9.40%	39.75%	12.44%	8.68%	100.00%
ODC + 401(k)	0.84%	32.87%	31.48%	0.84%	2.79%	28.13%	3.06%	100.00%
DB + ODC + 401(k)	2.50%	11.72%	5.47%	10.94%	32.19%	10.94%	26.25%	100.00%
Total	10.14%	36.65%	19.27%	6.03%	13.03%	10.17%	4.70%	100.00%

Table A3. Employers' Revision Activities for Firms Existing in Both 1985 and 1996

Revision Activity/Firm Choice in 1985	No Change	Term DB	Term ODC	Term 401(k)	Adp. DB	Adp. ODC	Adp. 401(k)	K sub. DB	K sub. ODC	ODC sub. DB	ODC sub. K	DB sup. ODC	Other	Total
DB only	25.29%	0.00%	0.00%	0.00%	0.00%	8.29%	14.57%	8.04%	0.00%	33.17%	0.00%	0.00%	10.64%	100.0 %
ODC only	56.04%	0.00%	0.00%	0.00%	0.91%	0.00%	10.95%	0.00%	30.25%	0.00%	0.00%	0.58%	1.27%	100.0 %
401(k) only	52.77%	0.00%	0.00%	0.00%	4.47%	7.39%	0.00%	0.00%	0.00%	0.00%	32.17%	0.00%	3.20%	100.0 %
DB+ODC	13.44%	25.78%	5.81%	0.00%	0.00%	0.00%	12.35%	11.33%	21.64%	0.00%	0.00%	0.00%	9.65%	100.0 %
DB + 401(k)	39.75%	10.21%	0.00%	4.66%	0.00%	8.68%	0.00%	0.00%	0.00%	12.44%	9.40%	0.00%	14.86%	100.0 %
ODC + 401(k)	28.13%	0.00%	31.48%	32.87%	3.06%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	2.79%	1.67%	100.0 %
DB + ODC + 401(k)	26.25%	10.94%	32.19%	10.94%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	19.68%	100.0 %