



## Determinants of Defined-Contribution Japanese Corporate Pension Coverage\*

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### ABSTRACT

Following the collapse of the Japanese financial bubble during the 1990s, Japanese corporations came to be saddled with increasingly large underfunded pension obligations. The gap between the level of retirement benefit promised and the market performance of retirement funds widened alarmingly, adding to the sense of corporate financial malaise during the “lost decade” that followed the market collapse. Partly in response, the passage of new corporate pension legislations in 2001 introduced the so-called defined-contribution pension plans whereby corporations were allowed to establish retirement plans on behalf of their employees on a voluntary basis whereby the terms of the retirement benefit were no longer defined in advance as in the traditional plans, but instead were conditioned on the actual performance of managed retirement funds. Only the periodic premium contributions to the plan during the employee’s active working life were now defined. This paper investigates the empirical determinants of the Japanese corporate decision to newly adopt the defined-contribution (DC) pension plans. Among the key findings of the paper are that the likelihood of adopting a new DC plan increases with an increase in the size of the firm, and that it decreases with an increase in the extent of underfunding of the firm’s existing defined-benefit (DB) pension plan, in sharp contrast to the American corporate incidence of DC pension.

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## 1. Introduction

Legislations passed in the Japanese parliament in 2001 have made it possible for Japanese firms to provide American-style defined-contribution (DC) pension plans to their employees on the voluntary basis. Firms adopting the plan typically give its employees the option of selecting among several financial products (funds) managed by an independent financial contractor. Patterned after the U.S. Tax Code 401(k) pension plan, firms adopting this plan make regular tax-deductible contributions to the participating employee's retirement account. The benefit payment to the employee is based primarily on the market value of the account at the time of retirement or job separation. The employee acquires ownership of the account after a brief period required toward vesting, and if the employee quits, the account is transferable under certain conditions to a new employer. Hence, there is neither underfunding nor overfunding associated with this plan, as its assets and liabilities are by definition equal.

The DC adoption by Japanese firms reflects some unique social and economic circumstances of the Japanese society which include rapid aging of the population, increasing underfunding in both the public and private pension plans, and the introduction of new accounting standards. Japan has had to adapt to the aging society, which gave rise to serious fiscal problems and resulted in the reform of public pension plans in 2000 and in 2004. With respect to the corporate world, there have also been major problems in the funding of employee retirement plans and their pension payments. Firms have been forced to address how best to contain retirement costs and to undertake changes in their pension plans.

The implicit understanding of long-term employment and the seniority-based compensation system with a steeply rising age-earnings profile used to be two of the most often cited characteristics of the Japanese labor market. Japanese firms invested relatively heavily in human capital accumulation of their employees, reinforced by the fact that the extent of labor market mobility, especially for the mid- to top-level corporate employees, has been limited. Traditional defined-benefit (DB) pension plans also buttress the sense of reciprocity between retirement compensation and long-term job tenure. And if those plans are unfunded, covered employees are in effect placed in a position of long-term unsecured bondholders who thereby assume an interest in the survival of the firm as argued by Ippolito (1985a, 1985b, 1995).

The majority of corporate DB plans in Japan, however, became seriously underfunded during the decade of the 1990s. It coincided with the collapse of the asset market that began with the freefalling stock market. The problem of seriously underfunded pension liabilities was compounded by the Japanese Ministry of Finance guidelines that in effect set the discount rate to be applied in the valuation of future pension benefits too high (at 5.5%) relative to the actual market performance of managed funds. The regular premium contributions calculated on the basis of that overly optimistic rate of return turned out to be seriously inadequate.<sup>1</sup> The rule was eventually overhauled, but the idea of DC pension as an alternative to the existing DB plans came to attract greater interest from both employers and employees as one way to address the growing corporate pension crisis.

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<sup>1</sup> Governmental regulation known as 5-3-3-2 also limited the realized returns. The rule mandated that the plan's asset allocation be at least 50% in domestic bonds, no more than 30% in equities, no more than 30% in foreign investments, and no more than 20% in real estate. The rates of return assumed by U.S. firms to assess their pension position are not subject to this kind of regulation, of course, and presumably they reflect the market conditions more accurately. See Bergstresser et al. (2006), however, for their recent finding that these rates may in fact be manipulated by the firm's management leading to distorted earnings and stock prices of U.S. corporations.

New pension accounting standards were introduced in March, 2001, requiring Japanese firms to disclose any unfunded retirement payment liabilities and include them in their balance sheet statement. Concerning the market valuation of managed pension funds, firms need to manage and reduce their unfunded liabilities appropriately, and the related bill which approved the establishment of DC plans was passed in October, 2001.

This paper aims at examining the Japanese corporate decision making regarding DC adoption. DC plans are very different from any existing DB plans, and so a switching to DC plans implies extensive changes even in the employment practice of the firm. Many incentives are at work, some conflicting, and the corporate decision making over pension plans is complex. We are motivated in this study to address the empirical question of which incentives play a more critical role in the ultimate managerial decision to opt for DC plans.

## 2. Japanese Pension Plans

The new DC pension has been introduced into the Japanese corporate pension system against the backdrop of existing DB pension plans. The various alternative plans that now exist can be summarized as follows.

### 2.1 Lump-Sum Severance Plan

The oldest traditional lump-sum DB plan called *taishoku hikiate-kin seido* (hereafter *hikiate-kin*) entails an internal reserve account that is voluntarily set up by the firm, whereby the firm's periodic "contribution" to the retirement account is partially tax-deductible from its corporate income tax even though it is an intra-firm credit transfer that does not require an explicit portfolio management of the account.<sup>2</sup> Retirement or severance payouts from the account typically take the form of a lump-sum payment determined on the basis of the employee's job tenure and salary history. The account's accumulated benefits are a legally binding liability of the firm, however. The plan calls for a one-time severance payment either for retirement or voluntary quit, and no periodic pension payment is involved subsequent to job separation.

### 2.2 Traditional Corporate DB Pension Plans

The other DB plans came into existence from a series of corporate tax laws passed in the 1960s that provided added tax incentives for an establishment of externally managed DB pension plans. Unlike the *hikiate-kin* system, the newer DB plans entailed an explicit portfolio management of pension funds to be managed by independent financial contractors, typically life insurance companies and trust banks. Two different versions were introduced, both entailing tax-qualified externally managed plans. The first version, called *zeisei-tekikaku nenkin*, was established under the 1962 tax legislation and came under the jurisdiction of the Japanese Ministry of Finance. The second version, called *kosei nenkin kikin*, was introduced by the 1965 legislative revisions of the Japanese Social Security System, and was placed under the jurisdiction of the Ministry of Health and Welfare. The *kosei nenkin kikin* was intended primarily for meeting the pension needs of larger corporations, and the minimum enrollment per plan was set initially at 1,000 employees.<sup>3</sup> By 1995 the total national

<sup>2</sup> The *hikiate-kin*'s tax-deductibility provision was eliminated in 2002 so the firm's contribution into the plan is no longer deductible.

<sup>3</sup> The minimum enrollment was subsequently reduced to 700, and then to 500 where it stands today. For further details on these plans, the determinants of their adoption, and the impact of adoption on stock prices, see Horiba and Yoshida (2002), and Yoshida and Horiba (2003).

enrollments in these DB plans came to approximately 11 million workers for the *zeisei-tekikaku nenkin*, and 12.1 million workers for the *kosei-nenkin kikin* plans.

### 2.3 Revised DB Plans

The collapse of the securities market after 1990 brought to light the potential problems of the traditional DB plans. In addition to the serious underfunding problem, questions arose as to the preservation of vested rights of covered employees and the responsibility of the plan's trustees who managed the plan. For the purpose of addressing the problems, at least in part, a related pension act was legislated in April, 2002, which revised the *kosei nenkin kikin* plan and allowed the return of a portion of its pension liability to the Ministry of Health and Welfare. In addition, two new DB plans called the *kikin* variety and the *kiyaku* variety were introduced, allowing possible incorporation of some of the defined-contribution ideas into the more traditional DB plans based on a new cash balance system.

### 2.4 Defined-Contribution Plans

The laws governing DC plans currently allow two types of DC plans. For firms with an existing DB plan that decide to offer a new DC plan, all premium contributions (up to a pre-determined legal limit per covered employee) are made solely by the employer and are deductible from corporate income tax. Unlike the U.S. 401(k) plan, however, employees of Japanese firms were not allowed to make individual contributions into this plan during the period covered in this study.<sup>4</sup> The second type of DC plan is for employees of firms that have no DB plan, and also for self-employed individuals. In this version all eligible premium payments fall on participating individuals, and are deductible from individual income tax. The focus of this paper is on the first type (called *kigyo-gata*) of corporate DC plan. Along with the passage of the new DC pension legislations, 2001 saw an enactment of new regulations that mandate the disclosure of the firm's pension liabilities in the annual financial statement, using substantially the same accounting standards as those in the U.S., and the mandated disclosure enabled the empirical inquiry of this paper. The main characteristics of the alternative pension plans can be summarized as follows.

#### COMPARISON BETWEEN DEFINED-CONTRIBUTION AND OTHER PENSION PLANS

Characteristics	Lump-Sum Severance Plans	Defined-Benefit Pension Plans	Kigyo-gata DC Pension Plans
Investment risk borne by:	Employer	Employer	Employee
Firm's unfunded liability:	Typically severe	Typically severe	No liability
Premium's tax status:	Partially deductible (disallowed after 2002)	Fully deductible	Deductible up to a limit
Degree of back loading in Benefit payment:	High	Some	Low
Plan's administrative cost:	Low	Relatively high	Relatively low
Portability to new employer:	None	Limited (possible only after 2005)	High

<sup>4</sup> The so-called 401(k) plans were established in the U.S. in 1981, and both employers and employees were allowed to make premium contributions into individual accounts. Japanese DC plans, on the other hand, were allowed to accept only employer contributions into the plan, but the rules were subsequently changed as of 2012 to allow employee's matching contributions into the plan as well.

### 3. Incentives for Adopting DC Plans

Corporate pension decisions are complex, especially with regard to adopting new DC plans which represent a sharp departure from staying with the traditional DB plans. The complexity reflects a wide variety of incentives at play, some of which may be mutually inconsistent. What follows is a catalogue of these incentives and the issues at stake.

#### <Risk Management>

Stone (1991) and Petersen (1994) analyzed managerial incentives for switching to DC plans and especially focused on corporate risk management. Stone argued that by switching to DC plans, firms shifted inflation and investment risks to the employees and also reduced administrative costs such as insurance, actuarial and accounting costs that would have been incurred in maintaining existing DB plans. Petersen also related DC pension to the question of risk and profit sharing between stockholders and employees. Though employees generally oppose any increase in their risk taking, they may accept it in exchange for keeping their employment in unprofitable firms. Both Stone and Petersen produced evidence that financially distressed firms tend to adopt DC plans.

From 1990 to the beginning of the 2000s, the Japanese stock market floundered wildly, and the corporate performance generally deteriorated, making it critically important for corporate managers to control various risks and contain financial losses. It may be presumed that less profitable and riskier firms, in particular, needed to address their risk management strategies. The issue here is whether or not it actually led to a greater propensity on the part of these firms to adopt DC plans.

#### <Underfunded Pension Liabilities>

Japanese plans are generally characterized by their underfunding and the associated pension liabilities, in contrast to American firms which often have overfunded pension plans.<sup>5</sup> For American firms it has been shown that unfunded pension liabilities negatively impact on the market valuation of the firm.<sup>6</sup> The underlying hypothesis here is that unfunded pension liabilities cloud the future earnings prospect of the firm at the same time as they result in the forfeiture of the current corporate income tax incentives associated with more robust premium contributions. Inasmuch as DC plans avoid this risk, the presumption is that an increased underfunding of DB pension liability increases the firm's incentive and hence the likelihood of adopting or switching to a DC plan.

If such a relationship also holds for Japanese firms, those firms with higher unfunded pension liabilities may be presumed to have added incentives to adopt DC plan. It must be emphasized, however, that Japanese firms are legally mandated to address unfunded DB pension liabilities before adopting new DC plans. There are two methods in satisfying this requirement: either an immediate reserve accounting for these liabilities, or reduction in liabilities by decreasing future benefits which must be negotiated with the labor union and is therefore difficult to achieve at

<sup>5</sup> Thomas (1989) and Mittelstaedt (1989) analyze the determinants of the recovery of overfunded pension plan. In particular, it is shown in Mittelstaedt and Regier (1993) that the shift to DC plan produces positive market reaction.

<sup>6</sup> See Feldstein and Seligman (1981), Daley (1984), and Barth (1991) among others. Franzoni and Marin (2006) argue, however, that the market tends to overvalue U.S. firms that carry underfunded pension plans. See also Picconi (2006). The link between DB pension plan and the market valuation of the firm is indeed an open-ended and complex one that continues to be debated.

least in the immediate sense. When the firm selects the former method, it has to finance the extraordinary pension obligation at once. Hence, from this vantage the DC adoption decision would be easier for firms with less unfunded pension liabilities. Regardless, the firm's overall financing capacity including the profitability of the firm may be critical in all cases involving DC plan's adoption.

*<Tax Consideration>*

Under the Japanese corporate tax rules, firm's premium payments into DB plans are allowed as legitimate corporate expense and hence reduce corporate income tax liability. For corporate contributions to DC plans, however, tax-favored treatment was restricted to the maximum deduction of 36,000 yen (which was subsequently raised to 46,000 yen after October, 2004) per covered employee per month for firms relying solely on the DC plan for its pension policy. For firms adopting a combination of both DC and DB plans, the tax deductibility that applies to the DC portion was limited to 18,000 yen (subsequently raised to 23,000 yen after October, 2004) per covered employee per month. Since no DB plans are subject to similar restrictions, the tax treatment favors the retention of DB plans over DC plans, especially for profitable firms for which the differential tax treatment may make a significant difference. Hence, more profitable firms may have lesser incentives to adopt the DC plans relative to unprofitable firms.

*<Stock Leverage Question>*

Stock leverage can be measured by the ratio of debt to total assets, as it serves as an indicator of what is left for shareholders in the event of the firm's insolvency. The agency models based on manager-shareholder conflicts as well as conflicts between equity holders and debt holders predict that leverage increases with firm value (Harris and Raviv 1990; Stulz 1990), with default probability (Harris and Raviv 1990), liquidation value (Williamson 1988; Harris and Raviv 1990), decrease in profitability (Friend and Lang 1988; Titman and Wessels 1988), and the extent of information asymmetry (Myers and Majluf 1984).<sup>7</sup> For U.S. firms, Stone (1991) obtained a positive and statistically significant association between leverage (total liabilities divided by total assets) and DC replacement of DB plans. This provides the basis for our test as to whether the total debt/asset ratio for Japanese corporations and the probability of their adopting DC plans is positively correlated.

*<Age Factor>*

In the DC plan, employees can manage the investment fund, and the level of future benefit is based on the actual investment performance. Older employees typically take a more negative view toward such a plan, feeling that there may not be an adequate period of time before retirement to redress any major losses that may be sustained in investment. Younger employees, on the other hand, may view the plan more favorably as the longer-term investment period may reduce such risks. Employees who leave a firm before their retirement may also suffer a large capital loss in the traditional DB plan while that risk is more limited for employees in the DC plan.<sup>8</sup> Consequently, the average age of workers in a firm may have influence over the firm's choice of pension plan.

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<sup>7</sup> See Harris and Raviv (1991), in particular, for survey of the literature on these and additional findings on corporate leverage.

<sup>8</sup> See Dorsey (1987) for evidence on this from American firms.

### <Plan's Administrative Cost>

In DB plans, premium contributions are invested in pooled funds, and so their management cost is almost like a fixed cost. In contrast, investment decisions in the DC plan are made by each employee, and there is less fixed-cost aspect to the DC plan. Based on the U.S. studies, this difference in the economies of scale in pension fund management leads to the greater likelihood for smaller firms opting for DC plans, and for larger firms staying with DB plans. In the Japanese corporate context, both in the *kosei* and the new *kiyaku* and *kikin* variety DB plans, firms staying with these plans need to check regularly the legal status of pension rights vested in employees and satisfy the prudent man rules, implying relatively high administrative costs. In implementing the complex pension accounting rules and procedures, firms with DB plans must generally bear proportionately higher accounting costs. Thus, from both the management and accounting cost standpoint, it should be the smaller firms that may find the DB plan less advantageous relative to the DC plan, thus opting for the DC plan.

### <Portability>

The portability of an individual DC account to a new employer who may allow such a transfer may be particularly attractive for younger employees. Individual holders of an account with a DC plan can possibly carry it to a new employer, and this portability should have a particular appeal to those employees who have alternative employment opportunities.<sup>9</sup> From the employer's perspectives, it may be harder for the firm to justify the use of the conventional DB plan as an incentives plan to retain workers if the necessity for a longer-term skill development is low. Therefore, DC plans may be adopted more readily in firms facing high job turnovers and generally having a shorter-term orientation or corporate objectives. Dorsey (1987) examined the relationship between job turnovers and the incidence of DC adoption and found some evidence in support of it for American firms. Does such a relationship also hold for Japanese firms?

### <Negotiation Cost>

Adopting a DC plan entails a significant change in the labor contract that requires negotiations with the labor union, as Japanese corporations are required by law to obtain the consent of its employees for effecting any significant changes in working conditions. In this regard, the decisions of other companies within the same industry often influence the negotiation process and its outcome in the Japanese corporate world because of the existence of various informal intra-industry alliances and coordination mechanisms on both the employer and employee sides. The incidence of DC adoption differs widely among industries, but appears to be progressing especially in the electric tools, transportation equipment, and commerce industries represented by such corporations as Sanyo, Sony, Mitsubishi Electric, Pioneer, Toyota, Honda, Itochu, Mitsubishi Trading Company and other leading Japanese corporations. For firms belonging to these industries, therefore, it may be that much easier to convince their employees and proceed with the DC adoption.

<sup>9</sup> By law, Japanese DC benefits become almost immediately vested with the employee. When an employee quits the job covered by DC plan, one of the following three options can be exercised by the employee with respect to the accumulated benefits: a) transfer to a new DC plan if the new employer offers DC plan; b) set up an individual DC plan if the new employer does not offer DC plan, in which case additional contributions to the plan are allowed only if the new employer does not offer any other pension plan; c) liquidate the account if DC coverage by the previous employer was for a period not exceeding three years.

#### <Informational Dissemination Cost>

In cases where firms adopt a new DC plan, it may be presumed that the management and the labor side understand the detailed terms and the various implications of the plan, which would require substantial information gathering and dissemination cost. As it turns out, there is major competition among banks, securities and insurance companies for acquiring DC pension businesses especially of larger corporations as their clientele. Although the traditional DB plans were managed mostly by investment banks and life insurance companies, the handling of DC plans is open to additional financial institutions such as commercial banks and brokerage houses. As a result, competition for these businesses has been intense, both before and during the enactment of the DC plan. In this connection, it should be mentioned that the network relationship that may exist among a loosely affiliated *keiretsu* corporate group continues to be a significant characteristic of the Japanese economy, though the extent of its cohesion is clearly weakening.<sup>10</sup> It may be presumed that there is considerable information sharing among the group centering on the “main bank” in the group, which argues for greater likelihood for typically large corporations belonging to the group to adopt new DC plans. That likelihood may be further enhanced for firms that have a greater international presence, as firms with many foreign stockholders are in an environment with greater awareness and understanding of developments such as the American corporate pension system that has seen a steep rise in the incidence of DC plans.<sup>11</sup>

## 4. Regression Model and the Empirical Findings

For this study we examined the financial records of 2,320 companies listed on the major Japanese Stock Exchanges (Tokyo, Osaka and Nagoya) obtained from Nikkei Economic Electronic Databank System (NEEDS-CD ROM), and identified 2,118 companies that had the requisite data base for the regression analysis. Specifically, 202 companies did not make that list for not reporting sufficiently detailed data concerning retirement accounting (30 companies), average age of workers (57 companies), cash flow information (79 companies), stockholder information (23 companies), and not having completed the entire 12-month fiscal year (13 companies). Of the 2,118 companies that form the basis of our regression analysis, 274 companies had adopted DC plans as of the fiscal year ended March 2005 after the legal inception of the DC program in 2001. The distribution of these companies by industry for the period December 2001 through March 2005 is given in table 1. With the exception of one company that adopted DC plan as an addition to the existing DB plan that subsequently remained unaltered, the adoption of DC plans by these firms replaced either wholly or partially the existing DB plans. Of the remaining 1,844 companies that had not adopted DC plans, 1,723 firms carried DB plans of either the *zeisei tekikaku nenkin* or the *kosei nenkin kikin* variety, and the remaining 121 were companies that carried only the internal *hikiate-kin* plan.

In order to address the issues raised in the preceding section, we employ the logit regression model to assess the probability of DC pension adoption on the basis of the explanatory variables listed below. Based on the existing literature review and empirical findings reported in U.S. studies, the expected sign of each regression coefficient is indicated in parenthesis following the variable name

<sup>10</sup> See Hoshi et al. (1991) and Spiegel and Yamori (2003) for analysis of the main bank system in Japan.

<sup>11</sup> See Jiang and Kim (2004) and Bae et al. (2006) for analysis of the role of foreign investors.

TABLE 1: DISTRIBUTION OF FIRMS AND THEIR PENSION STATUS BY INDUSTRY

Industry	Sample Total	Number of Firms That Adopted DC Plans During		
		Dec 2001- Mar 2003	Apr 2003- Mar 2004	Apr 2004- Mar 2005
Agriculture, forestry, and fisheries	8	0	1	0
Mining	8	0	0	0
Foods	112	3	4	6
Textiles	64	0	2	0
Pulp and papers	19	0	0	0
Chemicals	194	5	14	14
Oil and coal	8	0	0	0
Rubber and glass	70	2	3	3
Primary (ferrous/non-ferrous) metals	83	1	1	2
Metal products	73	0	2	1
Machinery	186	4	8	7
Electric tools	199	7	17	12
Transportation equipment	79	3	7	4
Precision instruments	31	1	1	1
Other manufactures	77	3	4	2
Construction	157	4	5	4
Utilities (electricity & gas)	20	0	2	3
Commerce	365	17	27	20
Real estate	46	1	0	0
Transportation and communications	124	3	3	7
Services	195	10	11	12
TOTAL	2118	64	112	98

*Note:* The DC adoption data are from *Nenkin Jyōhō* (Pension Information), published by *Kakutsuke Tōshi Jyōhō Sentā* (Center for Information on Investment Ratings), various issues.

and the presumed incentives at work in italics discussed in the preceding section that each variable refers to. It is to be noted that with respect to the  $X_5$  variable below designating firm's profitability, two conflicting incentives are at work, and the net effect on the probability of DC adoption is indeterminate on the *a priori* ground.

$X_1$  = the number of employees per firm: *plan's administrative cost* (-)

$X_2$  = the firm's leverage in its capital structure, measured as total liabilities divided by total assets: *stock leverage* (+)

TABLE 2: DESCRIPTIVE STATISTICS

Variables <sup>a</sup>	Firms with DC Plans		Firms without DC Plans		t-value <sup>d</sup>
	Mean	St. Dev.	Mean	St. Dev.	
X <sub>1</sub> : No. of employees	3307.3	7010.3	1553.8	4192.0	5.82
X <sub>2</sub> : Debt/Asset Ratio (%)	60.4	23.4	60.7	24.0	-0.21
X <sub>3</sub> : Cash Flow Volatility	2.21	6.65	2.92	6.82	-1.62
X <sub>4</sub> : DB Underfunding (%)	48.0	18.9	56.4	25.6	-5.18
X <sub>5</sub> : OCF/Asset Ratio (%)	6.01	5.52	4.16	5.71	5.05
X <sub>6</sub> : Labor turnover <sup>b</sup> (%)	7.68	2.83	7.77	2.83	-0.45
X <sub>7</sub> : Employee age <sup>c</sup>	38.0	3.64	38.8	3.80	-3.24
X <sub>8</sub> : Financial Institution Share Ratio(%)	30.1	15.7	24.6	14.6	5.78
X <sub>9</sub> : Foreigner Share Ratio (%)	8.04	10.3	4.72	7.86	6.23
X <sub>10</sub> : Industry Dummy Variable	0.41	0.49	0.29	0.45	4.36

<sup>a</sup> Unless otherwise noted, the data are from the *Nikkei NEEDS Data*.

<sup>b</sup> Industry-level data for 2001 obtained from the Japanese Ministry of Health, Labor and Welfare, *Koyō Dōkō Chōsa Hōkoku* (Survey Report on Employment Trends) 2001.

<sup>c</sup> Employee age obtained from *Kaisha Shikibo*, published by Toyo Keizai Shinpo-sha, 2001.

<sup>d</sup> The t-value represents the calculated t-statistic on the difference between the mean for firms with DC plans and the mean for those without DC plans

X<sub>3</sub> = cash flow volatility, measured as the coefficient of variation of cash-to-asset ratio over a 10-year period: *risk management* (+)

X<sub>4</sub> = relative pension underfunding, measured as the firm's cumulative pension liabilities minus market valuation of pension assets, divided by the cumulative pension liabilities: *underfunded pension liabilities* (+)

X<sub>5</sub> = the firm's profitability, measured as operating cash flow divided by total assets: *tax consideration* (-) and *the firm's ability to meet unfunded pension obligations as required by law* (+)

X<sub>6</sub> = labor mobility in the industry, proxied by the job turnover rate of the industry to which the firm belongs: *portability* (+)

X<sub>7</sub> = the average age of employees: *age factor* (-)

X<sub>8</sub> = the ratio of shareholding by financial institutions: *information dissemination* (+)

X<sub>9</sub> = the ratio of shareholding by foreigners: *the foreign ownerships question* (+)

X<sub>10</sub> = the industry dummy variable, identifying the firms that belong to the electric tools, transportation equipment, and commerce industries (= 1; 0 otherwise): *the relative ease of negotiation* (+).

Table 2 presents the mean values of the ten explanatory variables in two groups. The first group is for the 274 firms that adopted DC plans during the period December 2001 through March 2005, and the second group is for the remaining 1844 firms that did not. Casual inspection of the mean values reveals a remarkable finding suggesting that Japanese firms adopting DC plans had on average a substantially larger workforce and lower underfunding of DB liabilities, that are contrary to

TABLE 3: LOGISTIC ESTIMATION OF PLAN CHOICE, 2001-2005 <sup>a</sup>

Independent Variable	Analysis with Firm Size	Analysis without Firm Size
Intercept	-3.679 *** (-3.86)	-1.396 (-1.60)
X <sub>1</sub> : Firm Size	0.417 *** (6.07)	
X <sub>2</sub> : Total Debt/ Asset Ratio	0.001 (0.39)	0.007 ** (2.32)
X <sub>3</sub> : Cash Flow Volatility	-0.000 (-0.04)	-0.009 (-0.77)
X <sub>4</sub> : DB's Relative Underfunding	-0.009 *** (-3.09)	-0.010 *** (-3.39)
X <sub>5</sub> : Operating Cash Flow/Asset Ratio	4.372 *** (3.21)	4.863 *** (3.66)
X <sub>6</sub> : Industry Labor Turnover Rate	0.007 (0.27)	0.003 (0.11)
X <sub>7</sub> : Age	-0.035 (-1.65)	-0.038 * (-1.83)
X <sub>8</sub> : Financial Institution Share Ratio	0.611 (1.19)	1.807 *** (3.85)
X <sub>9</sub> : Foreigner Share Ratio	0.538 (0.67)	2.098 *** (2.93)
X <sub>10</sub> : Industry Dummy Variable	0.379 *** (2.63)	0.386 *** (2.71)
McFadden R <sup>2</sup>	0.0839	0.0608
Log Likelihood	-747.4	-766.2
No. of Observations for D = 1	274	274
No. of Observations for D = 0	1844	1844

<sup>a</sup> Table reports logit coefficients and z-statistics in parentheses. The asterisks indicate statistical significance at 10%(\*), 5%(\*\*), and 1%(\*\*\*) level, respectively.

expectations based on previous U.S. empirical studies. On the other hand, larger financial institution shareholding and larger foreign shareholding of firms adopting DC plans are generally consistent with the expectations. With respect to profitability, it turns out that firms that adopted DC plans are on average more profitable than those that did not, and the difference in the mean profitability between the two groups of firms is statistically significant. This last finding suggests an apparent dominance of the importance of the firm's ability to meet unfunded DB obligations based on its profitability over the tax incentives in adopting DC plans.

Table 3 shows the result of logit regression estimation to assess the likelihood of DC adoption. The dependent variable equals 1 if the firm adopted DC plan during the period in question, and zero

otherwise. To circumvent a possible simultaneity problem, observations on the independent variables all refer to the beginning year 2001. The left-hand column of table 3 reports findings based on the inclusion of all ten explanatory variables in the regression.<sup>12</sup>

The most striking difference observed between the U.S. and Japanese incidence of DC pension is with regard to the firm size and the financial status of the firm's existing DB plan, both of which produce opposite results from those reported in the U.S. studies. Our results are also statistically highly significant. Unlike the U.S. DC pension studies, we find that the likelihood of adopting DC plans by Japanese firms increases as the firm size increases, and with it the likelihood of retaining the existing DB plans diminishes.<sup>13</sup> Also, as the degree of DB underfunding increases, the likelihood of DC adoption diminishes, and not increases as in the U.S. incidence.

It turns out, therefore, that contrary to the popular belief that an increasing indemnity of underfunded pension is driving Japanese firms to switch from DB to DC plans, in fact it is inhibiting that likelihood. Our findings suggest that it is primarily the larger and more profitable firms that have adopted the DC plan. Evidently, the mandated liquidity needs for terminating the existing DB plans exerted such a constraint on firms contemplating on adopting DC plans that even for the larger, financially better-positioned firms the extent of DB underfunding has a significant negative impact on adopting the DC plans. The highly significant positive effect of the firm's profitability as measured by operating cash flow relative to the firm's total assets confirms the importance of the overall financial position of the firm in adopting new DC plans.

With respect to the remaining variables, we find that the DC adoption is indeed more likely to have occurred in the three industries of electric tools, transportation equipment, and commerce, holding all other variables constant. In regard to the work-force and labor-market attributes such as the average age of workers and the labor turnover rate, these variables have the "correct" sign in agreement with the underlying hypotheses but fail the significance test. There is only a weak support for the argument that firms that employ younger workers are more likely to have adopted DC plans. Likewise, variables such as cash-flow volatility, total debt-to-asset ratio, share holdings ratio by financial institutions and by foreigners register the correct sign but fail the significance test in the first regression equation.

The main bank system still remains as a factor in the Japanese corporate world, though its hold has been weakening. Larger firms usually have close relations with the main bank such that an active exchange of information beyond normal banking businesses may be presumed to be taking place. In addition, it is the larger firms that have an international visibility attracting stock ownerships by foreigners, as the remarkable rise in the importance of foreign presence in the Japanese financial market has been well recognized and documented.<sup>14</sup> According to our inter-correlation matrix shown

<sup>12</sup> We have experimented with over a dozen different regression specifications involving these explanatory variables, but the results are similar.

<sup>13</sup> A number of arguments have been advanced to justify the proposition that the likelihood of DB plans should increase with the firm size. The agency theory of management suggests that larger firms incur higher costs of monitoring employees, making DB plans more attractive (Lazear 1979). In addition, the economies of scale afforded by a larger firm size may lower the administrative cost of DB plan, and the pooling of larger pension funds may lower the investment risk. Empirical findings based on U.S. firms have generally supported the proposition that either there is a positive correlation between DB plan and the firm size, or a negative correlation between DC plan and the firm size, or both (Pesando and Clarke 1983; Kotlikoff and Smith 1983; Dorsey 1987; Stone 1991; Gustman and Steinmeier 1986; Petersen 1994; Kruse 1995; Ippolito 1995; Papke 1999).

<sup>14</sup> See, for example, Shirota (2002). He points out that increased foreign ownerships of Japanese shares have been influential in shifting corporate priorities from long-term to shorter-term objectives represented by maximization of the rates of earnings, and also from the retention of traditional DB plans that are more in line with the long-term employment practice to the adoption of DC plans.

APPENDIX TABLE. CORRELATION COEFFICIENTS AMONG EXPLANATORY VARIABLES

Explanatory Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) $X_1$	1.000	0.141	-0.134	-0.157	0.162	-0.076	-0.006	0.485	0.350	0.069
(2) $X_2$		1.000	0.145	0.186	-0.217	0.005	0.303	0.044	-0.206	0.020
(3) $X_3$			1.000	0.049	-0.081	0.099	0.047	-0.122	-0.094	0.007
(4) $X_4$				1.000	-0.119	0.007	0.145	-0.151	-0.127	-0.110
(5) $X_5$					1.000	-0.003	-0.201	0.088	0.173	0.043
(6) $X_6$						1.000	-0.238	-0.167	-0.049	-0.030
(7) $X_7$							1.000	0.110	-0.127	-0.218
(8) $X_8$								1.000	0.322	0.007
(9) $X_9$									1.000	0.098
(10) $X_{10}$										1.000

  

$X_1$ : Number of employees	$X_6$ : Operating Cash Flow/Asset Ratio	$X_9$ : Shareholdings Ratio by Foreigners
$X_2$ : Total Debt/ Asset Ratio	$X_7$ : Labor Turnover Rate	$X_{10}$ : Industry Dummy Variable
$X_3$ : Cash Flow Volatility	$X_8$ : Average Age of Employees	
$X_4$ : DB's Relative Underfunding	$X_5$ : Shareholdings Ratio by Financial Institutions	

in the appendix, the size variable has high positive correlations with such variables as the financial institutional shareholdings ratio and the ratio of stock ownerships by foreigners. Accordingly, the second regression deletes the size variable, and the result confirms the significance of these additional variables, at the same time retaining much of the same pattern as observed in the first equation for the other variables. Evidently, the size variable also serves in the regression as a proxy for these share ratios, and to a lesser extent for the corporate debt ratio as well.

## 5. Conclusions

The economics of corporate pension has spawned a large volume of literature with competing hypotheses and some conflicting empirical evidence. The experience of Japanese firms during the first several years following the inception of DC plans serves to highlight the importance of financial variables as key determinants of the ultimate adoption decision.<sup>15</sup> While some variables reflecting non-financial conditions such as the average age of employees appear to be relevant, it is the firm's more immediate concerns about how to meet the indemnity of the existing DB plans and the firm's overall profitability that appear to be pivotal in the decision to adopt the DC plan.

Concerning the firm size, we have found a positive and strong association between it and the probability of the firm's adopting DC plan, in sharp contrast to what has been found repeatedly for U.S. firms. Our explanation of what may otherwise appear as an anomaly in this instance is the way in which the financial variables interact with the firm size in the more unique Japanese corporate settings. Most of the larger firms maintain externally managed DB plans. Faced with the liquidity requirement for terminating these plans upon adopting DC plan, the extent of underfunded pension obligations and the firm's profitability, in particular, become a critical consideration. The majority of these firms, and especially those saddled with a heavy indemnity of the existing DB plans, have opted not to adopt the new plan. Hence, it is primarily large, profitable firms without the burden of heavy DB indemnity that have proceeded with adopting the new DC plan.

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<sup>15</sup> The importance of financial variables is also emphasized by Petersen (1994).

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