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Cash-Balance Plan Conversions: Evidence on Excise Taxes and Implicit Contracts

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Abstract

Firms that wish to switch from a traditional defined-benefit pension plan to a defined-contribution-type plan have a choice between converting to a cash-balance plan or replacing the defined-benefit plan with a full-fledged defined-contribution plan. According to Ippolito and Thompson's (1999; *Industrial Relations*, 39: 228-245) excise tax avoidance hypothesis, a number of firms have switched to cash-balance plans because conversion allows the firm to avoid excise taxes on its excess pension assets. In contrast to existing studies, our evidence supports the excise tax avoidance hypothesis. Cash-balance plan conversions also have been criticized for imposing pension losses on older employees. The implicit contract theory of pensions predicts that poorly performing firms would be the ones that would impose losses on employees. However, our evidence indicates that firms converting to cash-balance plans typically are not poor performers.

Introduction

The number of employees enrolled in traditional defined-benefit pension plans has declined dramatically in the past two decades relative to enrollment in defined-contribution-type plans (see, e.g., Ippolito, 1995). An interesting aspect of this transition is the large number of sponsors that converted traditional defined-benefit plans into cash-balance plans during the latter part of the 1990s. Cash-balance plans are similar to defined-contribution plans from an employee's perspective—for example, cash-balance plans have individual employee account balances that are portable. However, cash-balance plans operate like defined-benefit plans from a sponsor's perspective and are treated as defined-benefit plans for regulatory purposes. Ippolito (2002)

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reports that about 20 percent of defined-benefit plans, weighted by participation, have converted to cash-balance plans.[1] The objective of this article is to present evidence on two separate, nonmutually exclusive hypotheses about why firms convert to cash-balance plans. One hypothesis relates to the avoidance of excise taxes and the other hypothesis relates to the implicit contract theory of pensions.

Promoters of cash-balance plans argue that these plans provide a defined-contribution-type plan that is more valuable than a defined-benefit plan for most employees, especially younger employees who are likely to switch jobs frequently during their career.[2] If a defined-contribution-type plan is preferred, the natural question is why not simply terminate the defined-benefit plan and adopt a full-fledged defined-contribution plan. Ippolito and Thompson (1999) suggest (without providing evidence) that the answer lies in the tax code (also see Ippolito, 2001a and 2001b). Congress imposed an excise tax on reverted excess pension assets in the late 1980s and increased it under some circumstances to 50 percent in 1990. Thus, if a firm terminates an overfunded defined-benefit plan in favor of a full-fledged defined-contribution plan in the 1990s, it will lose a substantial part of the excess assets to excise taxes. If instead the firm converts to a cash-balance plan, the firm avoids the excise tax.[3]

The avoidance of the excise tax is not costless, however. First, greater administrative costs are likely to be incurred in managing a cash-balance plan than a full-fledged defined-contribution plan, because a cash-balance plan must meet the regulatory requirements of defined-benefit plans (Clark and McDermed, 1990; Ippolito, 1997). Second, when a firm converts to a cash-balance plan, it does not immediately gain access to the excess pension assets. Instead, the excess assets go into the cash-balance plan and must be used to fund future retirement benefits. Consequently, when deciding whether to convert to a cash-balance plan or switch to a full-fledged defined-contribution plan, a firm with an overfunded plan must consider the tradeoff between the excise taxes on the excess pension assets and the cost of restricting the use of those excess assets. The substantial increase in the excise tax in 1990 changed this tradeoff and thereby changed the impact of excess funding on the choice between converting to a cash-balance plan versus switching to a full-fledged defined-contribution plan. Relative to its effect in the 1980s, additional excess pension assets in the 1990s are hypothesized to have a positive impact on the likelihood of a cash-balance plan conversion.

[1] Bank of America appears to have introduced the first cash balance plan in 1985. In 1999, the IRS stopped issuing determination letters for cash balance plan conversions, pending the issuance by the Treasury Department of rules defining when cash balance plans do not violate age discrimination laws. As of June 2004, the IRS's moratorium on determinations letters was still in effect.

[2] Ippolito (1995) discusses the reasons why a defined-contribution-type plan might be preferred to a defined-benefit plan.

[3] There are other potential benefits of cash-balance plan conversions, which are not pursued in this article. For example, cash-balance plans offer employees a defined-contribution-type plan, but still provides the funding flexibility of a defined-benefit plan to the sponsor. Also, see Clark and Schieber (2001, 2002).

Several other studies have examined the effect of pension funding on the likelihood of a firm converting to a cash-balance plan, including Clark, Haley, and Schieber (2001), Coronado and Copeland (2003), Cowan and Power (2003), and D'Souza, Jacob, and Lougee (2004). Each of these studies compares the funding ratios of plans that converted to cash-balance plans to funding ratios of ongoing traditional defined-benefit plans. They do not find evidence that converters have greater funding ratios. According to the excise tax avoidance hypothesis, however, the comparison group should be plans that were terminated and replaced with a full-fledged defined-contribution plan, not ongoing defined-benefit plans. We therefore compare pension funding of firms that converted to cash-balance plans to the funding of firms that terminated a traditional defined-benefit plan and replaced it with a defined-contribution plan. Consistent with the excise tax avoidance hypothesis, our evidence indicates that the relationship between the likelihood of a cash-balance plan conversion and excess pension funding increased in the 1990s.

We also present evidence on a separate issue related to cash-balance plan conversions. Under a traditional defined-benefit plan, benefits generally are backend loaded, that is, employees accrue a disproportionate amount of their retirement benefits in the latter part of their careers. According to the implicit contract theory, employees pay for their pension benefits, through foregone wages, more evenly over their career (Ippolito, 1985). The difference between the accumulated foregone wages and the value of accrued benefits can be viewed as a bond posted by employees. If an employee leaves the firm or the firm terminates the plan prior to the employee's normal retirement age, the employee suffers a loss because part of the bond is forfeited. Similarly, if a sponsor unexpectedly reduces the benefit accrual rate (e.g., by converting to a cash-balance plan), employees can suffer pension capital losses.[4] Of course, employees can be compensated for these losses by adjustments on some other dimension of their compensation package. According to the implicit contract theory of pensions, firms would impose uncompensated pension capital losses on employees only when the firm's poor financial circumstances require it (Ippolito and James, 1992). When uncompensated losses are imposed on employees and the firm is financially viable, the firm can be viewed as reneging on the implicit contract.

Determining whether employee losses are associated with cash-balance conversions is difficult, as it depends on the specific plan characteristics and transition benefits provided, and we make no attempt to do so here.[5] Instead, we test whether cash-balance plan conversions occur in situations where the implicit contract theory of pensions predicts that employee losses would occur, that is, when firms are performing poorly. Existing evidence on defined-benefit plan terminations during the 1980s is

[4] IBM's conversion received special attention in the press because of its impact on employees' pension wealth. IBM subsequently altered their conversion plan to appease many of the employees who expected to be harmed by the original plan (see, e.g., Schultz, Auerbach, and Burkins, 1999).

[5] Clark and Schieber (2001) and Johnson and Uccello (2002) provide some evidence on how conversions affect hypothetical employees' pension wealth. Coronado and Copeland (2003) present evidence that projected benefit obligations do not decline on average following conversions, which suggests that conversions do not reduce overall benefit obligations.

generally consistent with the implicit contract theory, that is, plan terminations were undertaken by poor performers (see, e.g., Mittelstaedt, 1989; Pontiff, Shliefer, and Weisbach, 1990; Petersen, 1992).

Our evidence on the performance of firms that convert to cash-balance plans indicates that cash-balance plan converters generally are not poor performers. Therefore, for these transactions to be consistent with the implicit contract theory of pensions, employees would have to be compensated for the capital losses suffered as a result of the conversion. We leave future research to determine whether such compensation typically occurs in cash-balance plan conversions.

The article proceeds as follows. In the next section, we describe the main features of cash-balance plans and how they compare with defined-benefit plans. The hypotheses are derived in the following section, and the methodology used to test the hypotheses is described in "Methodology." We describe the data and present the empirical results on the excise tax avoidance hypothesis in "Analysis of Excise Tax Hypothesis." Evidence on the performance of firms converting to cash-balance plans is presented in "Performance of Cash-Balance Converters." We end with a short summary and our conclusions.

OVERVIEW OF CASH-BALANCE PLANS

General Description

From an employee's perspective, a cash-balance plan closely resembles a defined-contribution plan with employer contributions and a guaranteed rate of return. Each employee has a hypothetical account balance that grows based on salary credits and interest credits. Salary credits typically are stated as a percentage of the employee's earnings with the percentage often varying with years of service.[6] Interest is credited at a guaranteed rate that is periodically reset (e.g., the rate on 1-year treasury bills reset every 6 months). Prior to retirement, the account balance is portable. At retirement, the participant can take the account balance as a lump sum or as a retirement annuity.

Although each participant has an account balance, the funds are managed like a traditional defined-benefit plan. Contributions and investment earnings are not actually allocated to individual accounts; instead, contributions are made to a common trust fund for all participants and benefits are paid from the fund. Participants do not choose how "their" account balance is invested. The plan's trustee invests the assets and the sponsor is liable for any shortfall that might occur. If the return on the plan's assets exceeds the guaranteed interest credit, then the extra investment earnings are used to build up the plan assets and thereby reduce future sponsor contributions. Thus, from the sponsor's perspective, a cash-balance plan operates like a traditional defined-benefit plan and it is subject to same regulations as a defined-benefit plan.

[6] For example, Countrymark Corporation's plan credits the account balance with 3 percent of salary for employees with less than 5 years of service, but 9 percent of salary for employees with 30 years of service (Littell, 1996).

CHOICE BETWEEN A CASH-BALANCE AND FULL-FLEDGED DEFINED-CONTRIBUTION PLAN

Consider a firm with a defined-benefit pension plan, which wishes to switch to a defined-contribution-type plan.[7] The defined-benefit plan is characterized by its size, as measured by pension liabilities (PL) and by its excess funding ratio (EXFUND_RATIO) that equals the maximum of zero and the difference between pension assets (PA) and pension liabilities divided by pension liabilities (Max[0, (PA − PL)/PL]). To determine whether to switch to a full-fledged defined-contribution plan or convert to a cash-balance plan, the managers assess the costs and benefits of these alternatives. Anticipating a cross-sectional analysis of plans of different sizes, we enumerate the costs and benefits per dollar of pension liabilities.

Switching to a defined-contribution plan is likely to save administrative costs because the firm no longer needs to comply with the regulations related to defined-benefit plans or pay for the actuarial valuations of pension liabilities (Clark and McDermed, 1990).[8] The same savings in administrative costs would not be expected if the firm converts to a cash-balance plan, because a cash-balance plan must comply with the same regulations as traditional defined-benefit plans. We expect that the present value of the additional administrative cost associated with a cash-balance plan has a fixed cost component. Consequently, the additional administrative cost, per dollar of pension liabilities, will decline as the size of the plan increases. Letting C(PL) equal the additional administrative cost per dollar of pension liabilities, we assume that $C'(PL) < 0$.

If the defined-benefit plan has excess pension assets (EXFUND_RATIO > 0) and the firm terminates the plan in favor of a full-fledged defined-contribution plan, the firm must pay excise taxes on the excess pension assets. The Tax Reform Act of 1986 levied a 10 percent, nondeductible, excise tax on reverted pension assets and in 1988 the rate was increased to 15 percent. On November 5, 1990, the president signed the Revenue Reconciliation Act (RRA) that included a provision that increased the excise tax to 20 percent of reverted assets, provided that 25 percent of the excess pension assets is used as a cushion for a replacement plan or that benefits are increased by 25 percent. Otherwise, the excise tax is 50 percent. The important point that we utilize in the empirical analysis is that the excise tax increased substantially following the passage of the RRA of 1990.

The firm can avoid the excise tax on the excess assets and still have a defined-contribution-type plan by converting the traditional defined-benefit plan to a

[7] Our hypotheses are about the choice of a cash-balance plan or a full-fledged defined-contribution plan conditional on a firm switching to a defined-contribution-type plan. Consequently, in the main text we focus on the second stage of a two-stage decision process: In the first stage, a firm decides to switch to a defined-contribution-type plan and in the second stage, firms that decided to switch choose between a cash-balance plan or a full-fledged defined-contribution plan. A preliminary analysis of both stages is presented in Appendix A. As illustrated there, incorporating the first stage into the analysis does not change the main results presented in the text.

[8] Clark and McDermed (1990) and chapter 12 in Ippolito (1997) provide evidence of the differential administrative costs and that the differential costs have increased over time.

cash-balance plan. With a conversion, the excess assets remain within the plan, which restricts the use of those funds to the funding of future benefit accruals.[9] In a perfect capital market, this restriction would not be costly because the firm could simply borrow against the excess assets in the cash-balance plan if it needed funds for other positive net present value projects. However, due to the costs of raising external capital (see, e.g., Myers and Majluf, 1984; and Lee et al., 1996) and the inability to use pension assets explicitly as collateral, restrictions on the use of the excess assets is likely to be costly. We assume that this cost is proportional to the value of excess assets, where θ is the proportionality factor. For example, if $\theta = 0.2$, then the firm would be indifferent between having \$0.80 in cash or \$1 of excess assets in the cash-balance plan. In order to derive the main implications, we initially assume that θ is a constant. We then consider the additional implications from allowing θ to vary across firms.

Let τ be the excise tax rate on reverted pension assets. Then, for a firm that wishes to switch to a defined-contribution-type plan, the net benefit per dollar of pension liabilities of choosing a cash-balance plan versus a full-fledged defined-contribution plan equals

$$\tau \text{ EXFUND\_RATIO} - \theta \text{ EXFUND\_RATIO} - \text{C(PL)}. \tag{1}$$

In words, the net benefit of converting to a cash-balance plan equals the savings in excise taxes minus the cost of restricting the use of the excess pension assets, minus the extra administrative cost of a cash-balance plan.

Based on expression (1), we make two predictions. First, the net benefit of converting to a cash-balance plan increases, all else equal, as the size of the PL increases. This prediction follows from the assumption that $\text{C}'(\text{PL}) < 0$, which is due to higher fixed costs associated with managing a cash-balance plan than a full-fledged defined-contribution plan.

Second, the impact of excess funding on the net benefit of converting to a cash-balance plan is greater after the increase in the excise tax in 1990 than prior to the increase. This prediction follows from expression (1) for two reasons. First, the impact of an increase in the excise tax rate on expression (1) is greater the higher the excess funding ratio. Second, an increase in excess funding increases the net benefit of a cash-balance plan provided $\tau > \theta$, which is more likely to be true following the increase in the excise tax rate in 1990.

METHODOLOGY

As described below, we construct a sample of firms that switched from their defined-benefit plan to either a full-fledged defined-contribution plan or a cash-balance plan. We test whether among these firms, the likelihood of choosing a cash-balance plan is consistent with the predictions of the previous section. For our empirical analysis, we

[9] The excise tax avoidance explanation for cash-balance plans also suggests that cash-balance plans would be temporary structures, because once the excess pension assets are exhausted, the plan can be terminated and a defined-contribution plan can be established.

measure the size of the pension plan using the natural logarithm of pension liabilities (LOGPL).[10] We measure the excess funding ratio as pension assets minus pension liabilities, divided by pension liabilities. To account for different excise tax regimes, we create the dichotomous variable POST_RRA90, which equals 1 if the switch to a defined-contribution-type plan occurs after the passage of the RRA of 1990, and 0 otherwise. We cannot measure directly the costs associated with restricting the use of excess pension assets, θ. Nevertheless, in some specifications we include variables, such as profitability and firm size, which are likely to be correlated with θ. We discuss these variables below.

Our base empirical model for the net benefit per dollar of pension liabilities of a cash-balance plan relative to a full-fledged defined-contribution plan for a firm, which decides to switch to a defined-contribution-type plan in year t is specified as follows:

$$\begin{aligned} \mathrm{B} = {} & \alpha + \beta_1\ \mathrm{POST\_RRA90} + \beta_2\ \mathrm{EXFUND\_RATIO} \\ & + \beta_3(\mathrm{POST\_RRA90})(\mathrm{EXFUND\_RATIO}) + \beta_4\ \mathrm{LOGPL} + \varepsilon, \end{aligned} \tag{2}$$

where α and the β_i's are parameters to be estimated, and ε has a standard logistic distribution. A positive β_4 coefficient would be consistent with larger plans being more likely to convert to a cash-balance plan because of the greater fixed administrative costs associated with these plans. The parameter β_2 determines the impact of excess funding prior to the excise tax increase in 1990, and the parameter β_3 determines the additional impact of excess funding following the excise tax increase. We also include the dichotomous variable POST_RRA90 by itself. The focus of the analysis is on the coefficient on the interaction variable (β_3). The excise tax avoidance hypothesis implies that β_3 will be positive.

We do not observe the net benefits of converting (B), but we do observe whether the net benefits are positive, that is, whether a firm that switches to a defined-contribution-type plan chooses a cash-balance plan or a full-fledged defined-contribution plan. Consequently, we can estimate the parameters in (2), up to a proportionality constant, using a logistic regression (see Greene, 2000).

As mentioned above, the cost associated with restricting assets to the funding of future retirement benefits (θ) likely varies across firms. For example, holding other factors constant, θ is likely to be lower when the firm is performing well, because the firm is likely to be generating cash from operations and not need the cash in the pension plan. Also, larger firms, because of their better access to capital markets, are likely to have lower values of θ, all else equal. This reasoning provides the motivation for including the average return on assets in the previous 3 years (MEANROA) and the natural logarithm of corporate assets (LOGASSETS) in some specifications.[11] Note, however, that firm performance and firm size could be capturing other factors as well,

[10] We also used the inverse function (1/PL) and found similar results.

[11] The framework also implies that these effects are greater for firms with greater excess funding. We checked for such a nonlinear relationship by including interaction effects with the excess funding variables, but did not find significant coefficients on the interaction variables and the other results remain essentially unchanged.

and consequently we do not make strong interpretations of the coefficient estimates on these variables.

Ideally, the model would be estimated using plan-level data that unfortunately we do not have.[12] Therefore, we use firm-level data. Since firms can sponsor multiple plans, firm-level funding measures a particular plan's funding with error. While we expect that the funding of a particular plan would be positively correlated with firm-level funding, the measurement error could bias our estimates. As noted earlier, we are analyzing the second stage of two-stage process. In the first stage, a firm decides whether to switch from their defined-benefit plan to a defined-contribution-type plan. In the second stage, conditional on a switch, the firm decides whether to use a cash-balance plan or a full-fledged defined-contribution plan. If the randomness in the first-stage decision is correlated with the randomness in the second-stage decision, then the analysis of the second stage alone would yield inconsistent estimates (Greene, 2000). Appendix A summarizes a preliminary analysis that deals with this issue. The results of this analysis do not materially differ from those presented in the main text.

ANALYSIS OF EXCISE TAX HYPOTHESIS

Cash-Balance Converter Sample

Our sample of firms sponsoring cash-balance plans is constructed from several sources. Kwasha Lipton consulting group provided a list of 313 organizations with cash-balance plans. The May 31, 1999 issue of *Pensions & Investments* lists 326 organizations with cash-balance plans, of which 35 are not on the Kwasha Lipton list. Finally, by searching *Compact Disclosure* from 1988 through 2000 for financial statement disclosures mentioning cash-balance plans, we identify 76 firms with cash-balance plans, of which 30 are not on either of the other two lists.[13] This process identifies 378 (313 + 35 + 30) organizations with cash-balance plans. The sample selection process from this point is driven by the need to find financial information on the firm, which limits the sample to public companies, and by the need to find a conversion date that limits the sample to companies that disclose the year of the conversion in their financial statements filed with the Securities and Exchange Commission.

A large number of the 378 organizations with cash-balance plans are private companies or not-for-profit organizations. We found 222 companies in the *CRSP* database, indicating that their stock was publicly traded at some point.[14] For these companies,

[12] Identifying cash-balance plans is costly. Disclosures on Forms 5500 did not identify when a plan was a cash-balance plan until 1999 and as of July 2002 the complete 1999 Form 5500 data were not yet available. Even with plan-level data in 1999, we would need to trace plans back in time using Form 5500s from prior years to identify the plan's funding prior to the cash-balance plan conversion.

[13] Compact disclosure begins in 1987, but neither of our universities had access to the 1987 files. Therefore, we begin searching with the 1988 file.

[14] We search the *CRSP* database because it includes historical names, not just the most recent name, which is what *Compustat* contains. We record the permno from the *CRSP* database. Later in the process, we obtain the gvkey to access *Compustat*.

TABLE 1
Sample Selection Process for Cash-Balance Converters (Panel A) and Defined-Benefit Terminators (Panel B)

Panel A – Cash-Balance Converter Sample	Number of Firms
Initial list of firms with cash-balance plans (from Kwasha Lipton, Pensions and Investments, and Compact Disclosure search)	378
Delete firms that are not public companies	156
	222
Delete firms without a confirmed conversion year	86
	136
Delete firms without pension data	13
Final sample	123
Panel B – Defined-Benefit Terminator Sample	**Number of Firms**
Compact disclosure search for terminations or plan freezes	611
Delete firms for which disclosures are not related to pension plans	257
	354
Delete firms without a confirmed termination or freeze year	145
	209
Delete firms with defined-benefit replacement plan	43
	166
Delete firms without pension data	34
Final sample	132
Number with confirmed defined-contribution replacement plan	77

we search annual reports, 10Ks, and proxy statements contained in *Lexis-Nexis* for the year in which the cash-balance conversion took place. There are 136 companies for which we can identify the conversion year. We then obtain financial information from *Compustat*. In cases where pension disclosures or assets values are missing from *Compustat*, we search financial statements in *Lexis-Nexis* in an attempt to fill in the missing data. This process results in a sample of 123 public firms that converted their traditional defined-benefit plan to a cash-balance plan for which we have the conversion year, pension data, and asset value. Panel A of Table 1 summarizes the sample selection process for the cash-balance converters.

Defined-Benefit Terminator Sample

We construct a sample of firms that terminated a traditional defined-benefit plan through an electronic search of annual reports between 1988 and 2000 contained in *Compact Disclosure* using various phrases, such as "terminated plan," "terminated pension," "frozen benefit," and "curtailed plans." This search yields a list of 599 firms that potentially terminated or froze a defined-benefit plan. After reading the disclosures, we eliminate those firms with disclosures that clearly are not related to pension plans. The resulting list consists of 354 firms.

We then manually search annual reports, 10Ks, and proxy statements included in *Lexis-Nexis* to (1) confirm that the firm terminated or froze a qualified defined-benefit plan, (2) identify the year that the company froze or terminated the plan, and (3) identify, when possible, the type of replacement plan. We are able to confirm the year that a plan was frozen or terminated in 209 cases. Although 1988 is the first year in which we search annual reports in *Compact Disclosure* for disclosures of terminations, the disclosures sometimes refer to terminations that occurred prior to 1988. We keep these observations in the sample.

There are 43 cases in which the terminated defined-benefit plan is replaced by another defined-benefit plan. Almost all of these cases are associated with a pension asset reversion (the firm terminated an over-funded plan, reverted the excess assets to the firm, and established a follow-on defined-benefit plan with the same characteristics as the terminated plan). Since we are interested in a sample of firms that replaced their defined-benefit plan with a defined-contribution plan, we eliminate the firms with a defined-benefit replacement plan, leaving 166 potential observations. It is interesting to note that 37 of 43 terminations with a defined-benefit replacement plan occurred during the 1980s when the excise tax was relatively low.

We then obtain financial information from *Compustat*. If pension disclosures or asset size are missing from *Compustat*, we try to fill in the missing data by searching annual reports in *Lexis-Nexis*. The resulting sample consists of 132 public companies that either froze benefit accruals or terminated a defined-benefit plan for which financial information is available. Eighteen of the firms froze plans, 91 terminated plans, and 23 froze and then subsequently terminated plans. We treat firms that froze plans the same as those that explicitly terminated plans, although we find similar results if we exclude the 18 cases where the plan was frozen. For the cases in which the firm froze a plan and then subsequently (sometimes years later) terminated the plan, we use the termination year as the event year for all of the results reported in the article, but we find essentially the same results if we use the freeze year as the event year. Panel B of Table 1 summarizes the sample selection process for the defined-benefit plan terminators.

Of the 132 firms that terminated their defined-benefit plans, we are able to confirm that 77 firms replaced their terminated plan with a defined-contribution plan. We are unable to identify the replacement plan in the other 55 cases. We first estimate the model using all 132 defined-benefit terminators, and then again using the 77 cases with confirmed defined-contribution replacement plans.

Descriptive Statistics

Panel A of Table 2 gives the frequency distribution of event years: conversion year for cash-balance converters and termination year for defined-benefit terminators. Relatively few cash-balance conversions took place in the latter 1980s and early 1990s, but the number of conversions increased in the mid 1990s. The defined-benefit terminations, on the other hand, are more evenly distributed throughout the sample period. Panel B of Table 2 gives the frequency distribution for five major industry categories for both cash-balance converters and defined-benefit terminators. The table indicates that both samples come from a broad range of industries.

TABLE 2
Sample Frequency Distribution by Event Year (Panel A) and by Two-Digit SIC Code (Panel B)

Panel A: Year in Which Sample Firms Converted to Cash-Balance Plan or Terminated Defined-Benefit Plans

Year	Firms Converting to Cash-Balance Plans	Firms Terminating Defined-Benefit Plans
1985	0	1
1986	0	2
1987	4	10
1988	7	17
1989	7	9
1990	3	7
1991	2	10
1992	4	9
1993	4	8
1994	5	5
1995	11	11
1996	18	13
1997	21	16
1998	18	7
1999	15	4
2000	4	3
Total	123	132

Panel B: Two-Digit SIC Codes for Sample Firms

Two-Digit SIC Code	Description	Firms Converting to Cash-Balance Plans	Firms Terminating Defined-Benefit Plans
10–19	Mining & construction	3	6
20–39	Manufacturing	44	52
40–49	Transportation & public utilities	20	10
50–59	Wholesale & retail trade	12	19
60–69	Finance, insurance, & real estate	36	40
70–89	Services	8	5
	Total	123	132

As mentioned earlier, the substantial increase in the excise tax was signed into law on November 5, 1990. The law is effective for reversions after September 30, 1990, unless employees were notified of the termination prior to October 1, 1990. We therefore define the variable POST_RRA90 to be equal to 1 if the effective date of plan change was subsequent to September 30, 1990 and equal to zero otherwise. Because managers at the time could not have been certain about whether an excise tax increase would be passed in 1990 or the effective date of any change that would occur, we examine the robustness of the results to this classification method later in the article.

Table 3 provides descriptive statistics for the variables used in the empirical analysis. The data are divided into four categories based on whether the transaction occurred

TABLE 3
Descriptive Statistics for Cash-Balance Plan Converters and Defined-Benefit Plan Terminators

Panel A

		Cash-Balance Converters		Defined-Benefit Terminators		*p*-Values of *t*-Test (Rank Sum Test) for Difference in Means Between CB Conv and DB Term	
		Before	After	Before	After	Before	After
	N	21	102	44	88		
ASSETS ($ million)	Mean	11,136.3	29,927.0	3,695.5	1,044.8	0.24	0.01
	Median	2,146.1	3,866.4	184.6	234.1	(0.01)	(0.01)
	SD	27,076.2	86,028.4	12,979.1	2,897.2		
PL ($ million)	Mean	156.1	1,536.6	118.2	64.0	0.60	0.01
	Median	35.2	231.0	9.5	5.9	(0.01)	(0.01)
	SD	205.0	4,838.2	378.2	343.8		
EXFUND_RATIO	Mean	52.6	24.4	143.2	18.2	0.13	0.12
(%)	Median	26.1	16.6	65.2	6.4	(0.11)	(0.02)
	SD	72.3	27.6	375.9	26.1		
MEANROA (%)*	Mean	14.2	11.5	9.6	8.3	0.06	0.02
	Median	15.8	11.2	8.5	9.6	(0.01)	(0.04)
	ST	7.0	8.5	10.9	10.0		

Panel B

	Correlation Coefficient (*p*-Value) [Based on Entire Sample]		
	LOGPL	EXFUND_RATIO	MEANROA
LOGASSETS	0.69 (0.01)	−0.01 (0.90)	0.09 (0.18)
LOGPL		0.10 (0.11)	0.21 (0.01)
EXFUND_RATIO			−0.08 (0.25)

*There are fewer observations for MEANROA than the other variables due to missing data.
Notes: ASSETS equal the firm's total assets in the year prior to the pension change; PL equals the accumulated benefit obligation; EXFUND_RATIO equals the maximum of zero and the value of pension assets minus PL divided by PL; MEANROA equals the average return on assets during the 3 years prior to the event year. The level variables, assets, and pension liabilities, are converted to year 2000 dollars using the producer price index. Numbers under the column labeled Before (After) are for transactions occurring before (after) the Revenue Reconciliation Act of 1990.

before or after the RRA of 1990 and whether the transaction was a cash-balance plan conversion or a defined-benefit termination. The firm's pension liability equals the value of the accumulated benefit obligation in the year prior to the event year, restated in year 2000 dollars using the producer price index. The excess funding ratio (EXFUND/PL) equals the ratio of excess pension assets divided by the pension liability. The numerator of the excess funding ratio equals the maximum of zero and the

difference between the value of pension assets and the accumulated benefit obligation in the year prior to the pension change.[15] To measure firm size, we use total firm assets (ASSETS) in the year prior to the event year, restated in year 2000 dollars using the producer price index. MEANROA is the average return on assets over the 3-year period before the event year.

Panel A of Table 3 suggests that cash-balance plan converters differ from defined-benefit terminators in several respects. For example, firms converting to cash-balance plans are on average larger and have greater pension liabilities than firms terminating their defined-benefit plans. Also, cash-balance plan converters typically have a higher mean return on assets than defined-benefit terminators in both of the time periods.

Among the transactions prior to the RRA of 1990, defined-benefit terminators typically have a higher excess funding ratio than the cash-balance plan converters (e.g., median of 65.2 percent vs. 26.1 percent). However, among the transactions after the act, defined-benefit terminators have a lower excess funding ratio than the cash-balance plan converters (e.g., median of 6.4 percent vs. 16.6 percent).[16] These descriptive statistics provide preliminary evidence that the relation between pension funding and the likelihood of a cash-balance plan conversion changed after the excise tax was increased in 1990.

Note that the standard deviation of the excess funding ratio for defined-benefit terminators is extremely large prior to the excise tax increase compared to the ratio for defined-benefit terminators after the excise tax increase and the ratio for cash-balance converters during the entire sample period. The high standard deviation is largely due to one observation with excess pension assets equal to 24 times its pension liability.[17] Removing this observation from the sample does not change any of the results reported in the article.

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[15] Reported pension liabilities depend on the discount rate assumption used by the firm, which varies across firms. Therefore, we calculate pension liabilities using a common discount rate for all firms in a given year. For the years from 1993 to 2000, the common discount rate is the average monthly interest rate used to value annuities reported on the PBGC web site. Since the first year in which the Pension Benefit Guaranty Corporation (PBGC) reports the annuity interest rates is 1993, for the prior years we estimate the annuity rate using the PBGC's formula for the interest rates used to calculate insurance premiums and the average spread (80 basis points) of the annuity rate above the interest rate used for premiums. The adjusted pension liability figures are calculated assuming that pension liabilities have a duration of 9 years and using the difference between the discount rate assumed by the firm and the PBGC annuity rate. (We also used a 7-year duration and the basic results are unchanged.) For the 44 firms that did not disclose their assumed discount rates, we replace these missing values with the average values for the assumed discount rates among firms that report the assumed discount rate for the missing firm's event year. The logistic regression results are not substantively altered when the adjusted pension liability numbers are used in place of the reported numbers.

[16] Consistent with general trends, funding ratios in the 1990s are lower than in the 1980s (see Ippolito, 2001a).

[17] We confirmed from the firm's annual report that the observation was not a key punch error. We also checked other "unusual" funding ratios to make sure that they were not key punch errors.

Panel B of Table 3 gives correlation coefficients between the variables used in the analysis. Not surprising, larger firms tend to have larger pension liabilities; the correlation coefficient between the logarithm of assets (LOGASSETS) and the logarithm of pension liabilities (LOGPL) is 0.69. The correlation coefficients between the excess funding ratio (EXFUND_RATIO) and the other variables are relatively small.

Logistic Regression Analysis

Tables 4 and 5 present the results of estimating logistic regression models for the likelihood of converting to a cash-balance plan. The analysis in Table 4 includes all of the defined-benefit terminators and the analysis in Table 5 includes only those defined-benefit terminators with confirmed defined-contribution replacement plans.

TABLE 4
Logistic Regression Analysis of the Probability That a Firm Converts to a Cash-Balance Plan Relative to the Probability That a Firm Terminates a Defined-Benefit Plan

	(1)	(2)	(3)
Intercept	−3.37	−6.22	−6.61
	(0.01)	(0.01)	(0.01)
POST_RRA90	0.09	0.06	0.05
	(0.86)	(0.91)	(0.93)
EXFUND_RATIO	−0.30	−0.41	−0.38
	(0.59)	(0.36)	(0.47)
POST_RRA90 × (EXFUND_RATIO)	1.70	1.85	1.96
	(0.06)	(0.04)	(0.06)
LOGPL	0.85	0.62	0.73
	(0.01)	(0.01)	(0.01)
LOGASSETS		0.55	0.50
		(0.01)	(0.01)
MEANROA			3.63
			(0.11)
Pseudo-R^2	0.40	0.47	0.51
p-Value for chi-square test of H_0: sum of the coefficients on the EXFUND_RATIO variables = 0	0.06	0.06	0.08
Observation with CB = 1	123	123	117
Obsservation with CB = 0	132	132	123

Notes: EXFUND_RATIO equals the maximum of zero and the value of pension assets minus the accumulated benefit obligation of the firm's pension plans in the year prior to the pension plan change divided by the accumulated benefit obligation. LOGPL equals the natural logarithm of the accumulated benefit obligation in the year prior to the pension plan change. LOGASSETS is the natural logarithm of total assets in the year of the pension plan change. The level variables, firm assets and pension liabilities, are converted to year 2000 dollars using the producer price index. POST_RRA90 equals 1 if the pension plan change occurred after the Revenue Reconciliation Act of 1990 and 0 otherwise. MEANROA is the average return on assets in the 3 years prior to the year of the pension plan change. Coefficient estimates with p-values in parentheses are reported in the table. Analysis includes defined-benefit terminators for which the replacement plan could not be confirmed.

TABLE 5
Logistic Regression Analysis of the Probability That a Firm Converts to a Cash-Balance Plan Relative to the Probability That a Firm Terminates a Defined-Benefit Plan and Replaces It with a Full-Fledged Defined-Contribution Plan

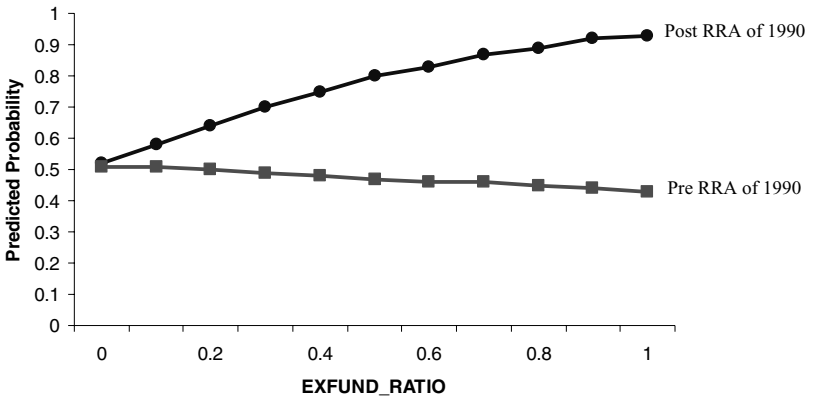
	(1)	(2)	(3)
Intercept	3.44	−6.42	−6.80
	(0.01)	(0.01)	(0.01)
POST_RRA90	−0.08	−0.32	0.03
	(0.89)	(0.59)	(0.97)
EXFUND_RATIO	−0.33	−0.46	−0.33
	(0.54)	(0.28)	(0.42)
POST_RRA90 × (EXFUND_RATIO)	2.45	3.09	2.89
	(0.06)	(0.03)	(0.04)
LOGPL	1.09	0.85	0.83
	(0.01)	(0.01)	(0.01)
LOGASSETS		0.58	0.55
		(0.01)	(0.01)
MEANROA			3.27
			(0.23)
Pseudo-R^2	0.48	0.54	0.54
p-Value for chi-square test of H_0: sum of the coefficients on the EXFUND_RATIO variables = 0	0.07	0.05	0.06
Observation with CB = 1	123	123	117
Obsservation with CB = 0	77	77	76

Notes: EXFUND_RATIO equals the maximum of zero and the value of pension assets minus the accumulated benefit obligation of the firm's pension plans in the year prior to the pension plan change divided by the accumulated benefit obligation. LOGPL equals the natural logarithm of the accumulated benefit obligation in the year prior to the pension plan change. LOGASSETS is the natural logarithm of total assets in the year of the pension plan change. The level variables, firm assets and pension liabilities, are converted to 2000 dollars using the producer price index. POST_RRA90 equals 1 if the pension plan change occurred after the Revenue Reconciliation Act of 1990 and 0 otherwise. MEANROA is the average return on assets in the 3 years prior to the year of the pension plan change. Coefficient estimates with p-values in parentheses are reported in the table. Analysis includes only those defined-benefit terminators for which a defined-contribution replacement plan could be confirmed.

In each table, columns 1 presents the results for the basic specification and columns 2 and 3 add the variables LOGASSETS and MEANROA to the specification.

In each of the specifications, the coefficient on LOGPL is positive, as predicted, and statistically significant, which suggests that firms with larger pension plans are more likely to convert to a cash-balance plan. As columns 2 and 3 indicate, the inclusion of the variable LOGASSETS reduces the magnitude of the coefficient on LOGPL, but the coefficient remains significantly different from zero. These results are consistent with fixed administrative costs increasing the likelihood that firms with larger plans will choose a cash-balance plan, all else equal (e.g., Clark and McDermed, 1990).

FIGURE 1
Predicted Probability of a Conversion to a Cash-Balance Plan as Function of Excess Pension Funding



Notes: EXFUND_RATIO equals the maximum of zero and the difference between excess pension assets and the accumulated benefit obligation divided by the accumulated benefit obligation. Predicted probabilities are based on the coefficient estimates from column 3 of Table 5 for a firm with median value of assets ($827 million), median value of pension liabilities ($30 million), and median value of MEANROA (10.4%). The figure compares the post-Revenue Reconciliation Act (RRA) of 1990 period (circle markers) to the pre-RRA of 1990 period (large square markers).

The coefficient on LOGASSETS is positive and statistically significant in each specification, suggesting that larger firms are more likely to convert to cash-balance plans, even after controlling for the size of pension liabilities. The positive coefficient is consistent with the notion that larger firms have lower costs of restricting the use of excess pension assets to funding future benefits when they convert to cash-balance plans. However, the variable might also be picking up other effects that are correlated with firm size. The coefficient on MEANROA is positive, which is consistent with more profitable firms having lower costs of restricting the use of excess assets. However, the coefficient on MEANROA is not statistically significant in either table.

We now move to the focus of the analysis—the coefficients on the excess funding variables. In each specification, the coefficient on EXFUND_RATIO is negative, but not statistically different from zero, but the coefficient on the interaction of EXFUND_RATIO and POST_RRA90 is positive and statistically significant. The positive coefficient on the interaction variable is consistent with the main prediction of the excise tax avoidance hypothesis. That is, additional funding after the RRA of 1990 increases the odds of a cash-balance plan relative to the effect of additional funding prior to the Act.

To illustrate the economic significance of the results, Figure 1 plots the predicted probability of a cash-balance conversion versus excess funding for a hypothetical firm with the median value of firm assets, pension liabilities, and return on assets. The figure compares the predicted probability prior to the RRA of 1990 to that after the Act. The predicted probabilities are based on the parameter estimates from column 3 of Table 5. The figure illustrates that pension funding and the tax regime have pronounced effects on the predicted probability. For high levels of excess funding, the

TABLE 6
Derivatives of Probability of Cash-Balance Plan Conversion With Respect to a Change in EXFUND

	Derivative of Predicted Probability of Cash-Balance Plan Conversion w.r.t. EXFUND_RATIO) (*p*-Values for Test That Derivative = 0 in Parentheses)		*p*-Values for Test of Equality of the Derivatives
EXFUND_RATIO	POST_RRA90 = 0	POST_RRA90 = 1	
0.0	−0.08	0.64	0.02
	(0.79)	(0.03)	
0.1	−0.08	0.62	0.02
	(0.79)	(0.03)	
0.2	−0.08	0.58	0.02
	(0.79)	(0.03)	
0.3	−0.08	0.53	0.01
	(0.79)	(0.02)	
0.4	−0.08	0.48	0.01
	(0.79)	(0.01)	
0.5	−0.08	0.42	0.01
	(0.79)	(0.01)	
0.6	−0.08	0.35	0.01
	(0.79)	(0.01)	
0.7	−0.08	0.30	0.01
	(0.79)	(0.01)	
0.8	−0.08	0.24	0.01
	(0.79)	(0.01)	
0.9	−0.08	0.20	0.02
	(0.79)	(0.01)	
1.0	−0.08	0.16	0.05
	(0.79)	(0.03)	

Notes: Derivatives are for a hypothetical firm with median values of assets ($827 million), MEANROA (10.4%), and pension liabilities ($30 million) using the logistic regression model reported in column 3 of Table 5. EXFUND_RATIO is the maximum of zero and the difference between pension assets and the accumulated benefit obligation divided by pension liabilities. *p*-Values for test of whether the derivative equals zero and whether the derivatives are equal are calculated using the delta method (see Greene, 2000).

predicted probability of a cash-balance plan conversion is considerably higher after the RRA of 1990 than before. For example, for a firm with EXFUND_RATIO equal to 0.5, the predicted probability of a cash-balance plan conversion is approximately 0.80 after the RRA of 1990 compared to 0.47 before the RRA of 1990.

Table 6 presents the estimated derivative of the probability of a cash-balance plan conversion with respect to a change in excess funding for the pre- and post-RRA periods for a firm with median values of pension liabilities, total assets, and return on assets using the model from column 3 of Table 5. Since the derivative is a nonlinear function of all of the coefficient estimates, we use the delta method to test whether the

derivative is different from zero and whether the derivative pre-RRA of 1990 equals the derivative post-RRA of 1990 (Greene, 2000). The derivative in the post-RRA of 1990 period is positive and significantly different from zero at the 5-percent level at each of the reported funding ratios. Moreover, we reject that the derivative during the post-RRA of 1990 period equals the derivative prior to the RRA of 1990 at the 5-percent level for each reported value of EXFUND_RATIO.

To check the robustness of the results to other specifications and variable definitions, we perform several analyses, the detailed results of which we do not report. A possible omitted variable in our analysis is a firm's tax-paying status. Firms can avoid part or all of the corporate income tax (but not excise tax) on the excess pension assets from a reversion if they have tax loss carryforwards or if they have negative profits during the year. We therefore include a dichotomous variable indicating whether the firm had tax loss carryforwards, and in a separate specification we include a variable indicating whether reported taxes were negative for the year (Peterson, 1992). In both cases, the coefficient on the tax variable is not statistically different from zero and the other results do not change.

We also check the robustness of the results by removing observations meeting certain criteria from the analysis. First, since cash-balance plan converters tend to be larger than defined-benefit terminators, we estimate the model after deleting firms in the top asset size decile. The essential results do not change, implying that the largest firms are not driving the results. Second, we eliminate the few observations that were highly influential in determining the coefficient on the interaction variable (POST_RRA90)(EXFUND_RATIO).[18] This analysis indicates that the conclusions are not due to a few influential observations. Third, seven of the defined-benefit terminators used an employee stock ownership plan (ESOP), at least in part, as the replacement plan. ESOPs are defined-contribution plans, but they receive special treatment under the excise tax law. If a firm uses excess pension assets from a terminated plan to fund an ESOP, the firm does not pay excise tax on the excess assets placed in the ESOP. Eliminating the observations with an ESOP replacement does not change the basic results.

Fourth, we remove the three observations that switched their defined-benefit plan during the second half of 1990 that is the time period just before and after the Congress passed the increase in the excise tax. Presumably, managers who were considering a switch to a defined-contribution-type plan just prior to the law being passed knew that the Congress was considering a change in the excise tax. However, these managers could not have been certain of the extent of the excise tax increase (if any) or of the effective dates of any change.[19] Also, firms that switched just after the law was passed could have notified employees of the switch prior to the effective date of the law. Omitting the three firms that switched to a defined-contribution-type plan in the

[18] Specifically, we eliminated observations with relatively large values of DFBETA, which equals the change in the coefficient with and without the observation divided by the standard deviation of the coefficient estimate.

[19] Proposed legislation to increase the excise tax in 1989 was not enacted. Also, the Senate bill that was reported in October of 1990 had a 40 percent excise tax, whereas the House bill had a 50 percent excise tax.

second half of 1990 does not change the main result: the coefficient on the interaction variable is positive and statistically significant.[20]

In summary, the results are consistent with the hypothesis that firms use cash-balance plans, at least in part, to avoid the excise tax on excess pension assets. Among firms that switched to a defined-contribution-type plan, those firms with greater excess pension assets were more likely to choose a cash-balance plan during the period after the excise tax rate increased.

PERFORMANCE OF CASH-BALANCE CONVERTERS

We now move to a separate issue related to cash-balance plan conversions. Firms that have converted to cash-balance plans have come under criticism, especially from older employees, because the conversion replaces a benefit formula that typically is heavily backend loaded with a formula that accrues retirement benefits at a more even rate over a worker's career. Unless the cash-balance plan benefit formula is adjusted so that the accrual rate increases with service (including pre-existing service), older workers can suffer significant wealth losses from a conversion. Appendix B provides a more detailed comparison of the benefit accrual pattern in a traditional defined-benefit plan to that in a cash-balance plan.

The implicit contract view of traditional defined-benefit plans recognizes that a sponsoring firm has the opportunity to impose losses on employees by changing the benefit accrual pattern late in an employee's career. However, the implicit contract theory implies that a firm would only do so when its financial situation demanded it. Thus, according to the implicit contract theory, employee losses would be associated with poor financial performance (see, e.g., Petersen, 1992, and Ippolito and James, 1992).[21] To investigate whether conversions take place when the implicit contract theory of pensions suggests that employees would suffer losses, we examine the performance of firms that convert to cash-balance plans.

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[20] This analysis did reveal that the classification of one observation (TCF Financial with an excess funding ratio of 335%, which converted to a cash-balance plan on September 1, 1990) was very influential on the statistical significance of the coefficient on the EXFUND_RATIO variable. When this observation was omitted, the negative coefficient on EXFUND_RATIO became statistically significant. Also, the *p*-value for the positive coefficient on the interaction variable declined to less than 0.01 in most specifications.

[21] Other factors, not examined here, might influence the incentive to impose losses on employees. Since the cost of breaking an implicit contract with unionized employees is likely to be higher than with nonunionized employees, the implicit contract perspective implies that firms with unionized workers would be less likely to impose losses, all else equal. Also, if managers who have developed a reputation with existing employees find it personally costly to break implicit contracts with employees, then firms that have undergone control changes (e.g., following a takeover) are more likely to impose losses (Shleifer and Summers, 1988). Ippolito and James (1992) and Chaplinsky, Niehaus, and Van de Gught (1998) analyze whether firms break implicit pension contracts in leveraged buyout transactions. Mittelstaedt and Regier (1990), Petersen (1992), and Pontiff, Shleifer, and Weisbach (1990) analyze whether firms break implicit contracts in pension plan reversions. The magnitude of the one-time gain from breaking the implicit contract would also influence firms' decisions to impose losses. This amount typically is greater if the plan has a unit-benefit formula and a large proportion of participants are in the middle of their careers.

TABLE 7
Operating Performance of Firms That Converted to Cash-Balance Plans

	Observations	Median	Mean
Difference between MEANROA of firms with cash-balance plan conversions and the median value for MEANROA of firms with the same two-digit SIC code and defined-benefit plans	119	1.12%*	3.28%*
Difference between MEANROA of firms with cash-balance plan conversions and the median value for MEANROA of firms with the same two-digit SIC code, defined-benefit plans, and with assets between 70% and 130% of total assets for the firm with the cash-balance plan conversion**	115	0.01%	0.02%

*Indicates significance at the 1% level using a *t*-test for the mean and sign test for the median.
**Firms without a match are excluded.
Notes: Operating performance of firms that converted to cash-balance plans is compared to other firms with defined-benefit plans in the same two-digit SIC and to other firms with defined-benefit plans of comparable size in the same two-digit SIC code. Operating performance (MEANROA) is the average return on assets over a 3-year period prior to the conversion. Return on assets is defined as operating income before depreciation divided by total assets.

It is important to highlight that the following analysis does not compare cash-balance plan converters to other defined-benefit terminators (as in the previous section). The prediction of the implicit contract theory, as applied to cash-balance plan converters, is that cash-balance plan converters are poor performers relative to firms that do not terminate their defined-benefit plans. Consequently, the comparison group in this analysis consists of firms that retained their defined-benefit plans.

Operating Performance

Table 7 provides information about the operating performance of firms with cash-balance plan conversions using the methods suggested by Barber and Lyon (1996). To assess operating performance, we use MEANROA that equals the average of annual operating income before depreciation divided by total assets over the 3-year period prior to the conversion.[22] Row 1 compares MEANROA for firms with cash-balance conversions to the median value of MEANROA of other firms with the same two-digit SIC code and with pension disclosures in *Compustat* (indicating that the firm has a defined-benefit plan). These data indicate that the operating performance of firms that convert to cash-balance plans is not worse than that of firms that retain

[22] We also measured operating performance using data for the 3-year period before the conversion and the year of the conversion and found similar results.

their defined-benefit plans. The mean (median) difference between MEANROA of firms with cash-balance plan conversions and the median of other firms in the same industry is 1.13 percent (0.27 percent).

Row 2 of Table 7 compares the operating performance of firms with cash-balance plan conversions to the median operating performance of firms that retained their defined-benefit plans with the same two-digit SIC code and with total assets between 70 percent and 130 percent of the total assets of the cash-balance plan converter. Neither the mean nor median difference in MEANROA is statistically different from zero. This evidence also indicates that cash-balance plan converters typically are not poor performers.

The operating performance results contrast with the results reported in studies examining the termination of overfunded pension plans during the 1980s. For example, Thomas (1989) finds that firms that terminated overfunded plans and that were not subject to control changes had significantly lower operating performance than nonterminating firms. Petersen (1992) finds that, after controlling for a number of other factors, the likelihood of an overfunded termination is negatively related to the return on assets. Mittelstaedt (1989) finds that termination of overfunded plans is associated with financial weakening, as measured by changes in predicted bankruptcy probabilities.[23] Thus, our operating performance results suggest that cash-balance plan conversions are motivated by different factors than the wave of overfunded pension terminations during the 1980s.[24]

Stock Price Performance

The stock price performance reported in Table 8 also indicates that cash-balance plan converters are not poor performers. We calculate annualized 1-year through 3-year buy-and-hold returns prior to the conversion against different portfolios of firms with defined-benefit plans.[25] Following Fama and French (1992) and Barber and Lyon (1997), size-matched portfolios consist of all firms with market capitalization in June

[23] Recall that when constructing the sample used in the first part of the article, we identify firms that terminated their defined-benefit plans and replaced them with another defined-benefit plan. Although the sample size is small, we find that these firms' operating performance in the 3 years prior to the termination is on average significantly worse than firms of comparable size in the same industry, which is consistent with the findings of the more complete studies cited in the text.

[24] Additional evidence on the motivations for overfunded terminations in the 1980s is provided by Alderson and Chen (1986), VanDerhei (1987), Mitchell and Mulherin (1989), Mittelstaedt and Regier (1990), and Alderson and VanDerhei (1992), who examine stock price reactions to reversions. Alderson and VanDerhei (1992) find that positive stock price reactions to reversions is concentrated in firms that have poor performance, a large amount of excess pension assets, and firms that restructure their pension plans following the reversion. Although there are possible tax explanations, these results are consistent with the argument that financially weak sponsors create value for their shareholders by reducing future benefit costs.

[25] A cash-balance converter is excluded from the stock performance analysis if it has less than (1) 6 months return data in the year prior to conversion, (2) 12 months return data in the 2 years prior to conversion, or (3) 24 months in the 3 years prior to conversion.

TABLE 8
Stock Price Performance of Firms That Converted to Cash-Balance Plans

Difference Between Firms With Cash-Balance Plan Conversions and	Number of Observations Mean Median		
	Years Relative to the Year of Conversion		
	1 year	2 years	3 years
Size-matched portfolios	117	115	111
	6.7%*	5.8%*	6.0%*
	6.7%*	7.8%*	7.9%*
Size and book-to-market-matched portfolios	117	108	97
	5.7%*	7.8%*	8.5%*
	6.8%*	7.8%*	7.9%*

*Indicates significantly different from zero at the 1% level using a *t*-test for the mean and sign test for the median.

Notes: Stock price performance is measured using the annualized pre-conversion buy-and-hold returns over 1-year, 2-year, and 3-year periods using two benchmarks: (1) a size-matched portfolio and (2) a size and book-to-market-matched portfolio. Size-matched portfolios consist of all firms with defined-benefit plans and with market capitalization at the end of each year within 90 percent and 110 percent of the sample firm's market capitalization. Size and book-to-market-matched portfolios consist of all firms in the size-matched portfolio with book-to-market ratios at the year end within 90 percent and 110 percent of the sample firm's book-to-market ratio at year end. A sample firm is not included if its 1-year, 2-year, and 3-year prior-conversion return history is less than 6 months, 12 months, and 24 months, respectively.

of each year within 90 percent and 110 percent of the sample firm's market capitalization in June. The size and book-to-market-matched portfolio consists of all firms in the size-matched portfolio with book-to-market ratios within 90 percent and 110 percent of the sample firm's book-to-market ratio, where the book-to-market ratio is calculated using the book value of common equity reported on the balance sheet in the prior year divided by the market value of common equity in December of the prior year. Both size and book-to-market matching are performed every year during the comparison period. Regardless of the benchmark or the holding period, we do not find evidence that cash-balance plan converters on average have significantly worse performance than the benchmarks. On the contrary, the cash-balance plan converters generally exhibit superior performance relative to other firms with defined-benefit plans. For instance, significant at the 1-percent level for both a *t*-test and a sign test, converters' 3-year prior conversion mean (median) stock return is 8.5 percent (7.9 percent) higher than the stock performance of firms matched with size and book-to-market ratios.

Debt Ratings

Another commonly used benchmark for assessing a firm's financial condition is its debt rating. We therefore compare the S&P Long-Term Credit Rating as reported in

Compustat (data number 280) of cash-balance plan converters in the year of and in the year prior to the conversion to the medium debt rating of comparable firms.[26] Debt ratings are assigned numerical scores as follows: AAA = 21, AA+ = 20, AA = 19, . . . , CC = 2, C = 1. Only 84 (73) of the cash-balance plan converters have a debt rating reported in the conversion year (year prior to the conversion year) in *Compustat*. As displayed in Table 9, the median debt rating of cash-balance plan converters is 15 (when rounded), which corresponds to a BB+ rating.

We compare the debt ratings of the cash-balance plan converters to the median debt rating of other firms with the same two-digit SIC code and to other firms with the same two-digit SIC code and with assets between 70 percent and 130 percent of the value of the cash-balance plan converter's assets in the year of the conversion. The results are reported in Table 9. Using debt ratings for the year of the conversion, Panel A indicates that the mean (median) difference between the debt rating of the cash-balance plan converters and the median of other firms in the same industry is 0.05 (1.00), which is not significantly different from zero. The mean (median) difference between the cash-balance converters and the median of other firms within plus or minus 30 percent of the assets of the converter and in the same industry is −0.28 (0.00), which also is not significantly different from zero. Using debt ratings for the year prior to the conversion year, Panel B indicates that there is no evidence that cash-balance plan converters have lower debt ratings than comparable firms. Indeed, there is weak evidence that the debt ratings of cash-balance plan converters are slightly higher than those of comparable firms.

To summarize, the operating performance, stock price performance, and debt rating evidence indicate that firms that undertake cash-balance plan conversions generally are not poor performers. The implicit contract theory of pensions suggests that employee pension losses would occur when firms are performing poorly. Because we do not know whether employees typically suffer wealth losses in conversions, our conclusions from the performance evidence are necessarily limited. However, we can state that cash-balance plan conversions are not taking place in situations in which the implicit contract theory predicts that employees would suffer losses.

SUMMARY AND IMPLICATIONS

Despite the growing importance of cash-balance pension plans in the private retirement system in the United States, we have little evidence on the characteristics of firms that are using these hybrid plans. The main purpose of this article is to fill this gap and thereby further our understanding of why a large number of firms converted their defined-benefit plans to cash-balance plans, particularly in the 1990s. Our evidence indicates that part of the reason firms converted their defined-benefit plans to

[26] Carroll and Niehaus (1998) find that debt ratings are positively related to pension funding, holding other factors constant, and our analysis earlier in the article indicates that pension funding is positively related to likelihood of converting to a cash-balance plan (vs. switching a full-fledged defined-contribution plan). Although the analysis here compares debt ratings of firms that converted to a cash-balance plan to firms that did not terminate their defined-benefit plans, the reader should interpret any relation between debt ratings and the likelihood of converting cautiously given that both variables are endogenous and could depend on pension funding.

TABLE 9
Debt Ratings of Firms That Converted to Cash-Balance Plans

	N	Mean	Median	*p*-Values for *t*-Test	*p*-Values for Sign Test
Panel A					
Cash-balance converters in the year of the conversion	84	14.10	14.50		
Difference in debt rating of cash-balance converter and the median of other firms in the same two-digit SIC code	83	0.05	1.00	0.87	0.37
Difference in debt rating of cash-balance converter and the median of other firms in the same two-digit SIC code and with assets + or −30% of the cash-balance plan converters' assets	74	−0.28	0.00	0.44	0.62
Panel B					
Cash-balance converters in the year prior to the conversion year	73	14.52	15.00		
Difference in debt rating of cash-balance converter and the median of other firms in the same two-digit SIC code	73	0.52	1.00	0.16	0.04
Difference in debt rating of cash-balance converter and the median of other firms in the same two-digit SIC code and with assets + or −30% of the cash-balance plan converters' assets	67	−0.16	0.00	0.67	0.99

Notes: Debt ratings are assigned numerical scores as follows: AAA = 21, AA+ = 20, AA = 19, AA− = 18, BBB+ = 17, BBB = 16, ... CC = 2, C = 1. Panel A examines debt ratings in the year of the conversion and panel B examines debt ratings in the year prior to the conversion year. Mean and median values in the first row of each panel are for the cash-balance plan converter sample. Means and medians in rows 2 and 3 of each panel are the differences between the cash-balance plan converters' debt ratings and the median of the benchmark group.

cash-balance plans as opposed to switching to full-fledged defined-contribution plans in the 1990s was to avoid excise taxes on excess pension assets.[27]

During the 1980s, a firm could terminate its defined-benefit plan and switch to a full-fledged defined-contribution plan and still gain access to the majority of its excess pension assets. The substantial increase in the excise tax on excess assets from terminated plans in 1990, however, increased the cost of terminating an overfunded

[27] Of course, the avoidance of excise taxes is not the sole reason for cash-balance plans. For example, some firms converted prior to the imposition of the excise tax or when the excise tax was relatively small, and some firms converted even though they had little or no excess assets to shield from excise taxes.

defined-benefit plan and switching to a full-fledged defined-contribution plan. Consistent with Ippolito and Thompson's (1999) conjecture, our evidence suggests that the increased excise tax has led many firms that wanted a defined-contribution-type plan to convert their defined-benefit plan to a cash-balance plan. By converting, the firm avoids the excise tax and therefore can use all of its excess assets, albeit at the cost of restricting the use of those excess assets to fund future pension benefits.

The Congress passed the excise tax law presumably to discourage pension asset reversions, because reversions removed the assets backing pension liabilities and potentially imposed wealth losses on employees. However, Ippolito (2001a) demonstrates that excise taxes have increased a sponsor's cost of contributing to a defined-benefit plan and thereby led to a significant decline in the funding of defined-benefit plans during the 1990s. Our results suggest that many firms are using cash-balance plans as a way to switch to a defined-contribution-type plan while avoiding the excise taxes. Thus, the excise tax does not seem to be effective in achieving its presumed intent, that is, protecting traditional defined-benefit pension benefits.

Because cash-balance plan conversions have been criticized for imposing pension wealth losses on older employees, we also examine whether conversions are taking place when firms are performing poorly, which is when the implicit contract theory of pensions suggests that wealth losses would take place. However, we do not find that cash-balance plan converters are poor performers. This evidence suggests that if cash-balance plan conversions are imposing wealth losses, they are not doing so in situations that are consistent with the implicit contract theory of pensions.

APPENDIX A

Preliminary Results on the Sample Selection Issue

A potential concern is that we are analyzing the second stage of a two-stage process. In the first stage, a firm decides whether to switch from their defined-benefit plan to a defined-contribution-type plan. In the second stage, conditional on a switch, the firm decides whether to use a cash-balance plan or a full-fledged defined-contribution plan. Since we analyze firms that reach the second stage, the firms in our sample are "selected" because the net benefits associated with switching from a defined-benefit plan to a defined-contribution-type plan are positive. Even though our hypotheses relate to the group of firms that switched to a defined-contribution-type plan and not the general population of firms with defined-benefit plans, this selection process would yield inconsistent estimates if the randomness (error) in the first-stage selection decision is correlated with the randomness (error) in the second stage (Greene, 2000).

To address this issue, we specify a simple model for the decision to move from a defined-benefit (DB) to a defined-contribution (DC)-type plan. The net benefit of switching to a defined-contribution-type plan is determined in large part by the nature of the work performed by employees and employees' expected mobility (see e.g., Ippolito, 1994, 1995). We use industry categories as a proxy for these labor market characteristics. Specifically, consistent with existing evidence (D'Souza et al., 2004), we expect that a firm is more likely to choose a defined-contribution-type plan if it operates in a service industry. We therefore use the dichotomous variable, SERVICE_IND, to indicate whether the firm operates in an industry with an SIC code above 4999. Our simple model also controls for firm size as measured by the natural

logarithm of assets and the size of the existing defined-benefit pension plan as measured by the natural logarithm of pension liabilities. Letting y equal the net benefit of a defined-contribution-type plan, we assume that

$$y = \gamma_0 + \gamma_1 \text{ SERVICE\_IND} + \gamma_2 \text{ LOGASSETS} + \gamma_3 \text{ LOGPL} + \varepsilon_1,$$

where ε_1 has a standard normal distribution. The model for the second stage—the choice of a CB plan versus a full-fledged defined-contribution-type plan—is presented in the main text

$$\begin{aligned} \text{B} = {} & \alpha + \beta_1 \text{ POST\_RRA90} + \beta_2 \text{ EXFUND\_RATIO} \\ & + \beta_3(\text{POST\_RRA90}) \text{ (EXFUND\_RATIO)} + \beta_4 \text{LOGPL} + + \beta_5 \text{ LOGASSETS} + \varepsilon_2, \end{aligned}$$

where we assume for this analysis that ε_2 also has a standard normal distribution. Unfortunately, we do not observe y or B; instead we observe

$$\text{DC} - \text{type} = \begin{cases} 1 \text{ if } y > 0 \\ 0 \text{ if } y \leq 0 \end{cases} \quad \text{CB} = \begin{cases} 1 \text{ if } B > 0 \\ 0 \text{ if } B \leq 0. \end{cases}$$

Following Boyes, Hoffman, and Low (1989), we estimate the parameters of the model by maximizing the log likelihood function for the sample used in the text (for which DC-type = 1) augmented by a sample of firms that did not switch to a DC-type plan (for which DC-type = 0).

We create the sample of firms that did not switch to a DC-type plan (those with DC-type = 0) in four steps: First, we identify the 21,950 observations (firm-years) in *Compustat* over the period from 1987 through 2000, which have nonmissing and nonzero values for pension assets and pension liabilities in two consecutive years. Second, we exclude the observations for which pension liabilities increased by more than 25 percent or decreased by more than 15 percent from the previous year with the intention of eliminating observations that might have had major changes in the pension benefit structure over the year. This leaves 17,045 potential observations. Third, we eliminate the firms that are in our sample of firms, which switched to a defined-contribution-type plan, that is, the observations used in the main part of the article. This leaves 15,791 potential observations (firm-years). Finally, so that the number of observations with DC-type = 1 is comparable to the number of observations with DC-type = 0, we randomly order the potential observations and select every 50th one so that we have a sample of 315 firms that retained their defined-benefit plans.

Table A1 reports two sets of estimates. Column 1 reports the coefficient estimates from estimating each equation separately using bivariate probit and column 2 reports the coefficient estimates from maximum likelihood of both equations simultaneously, taking into account that all of the firms in the second-stage analysis have DC-type = 1 and allowing the error terms in the two equations to be correlated. The results indicate that the potential sample selection issue does not change the main result of the earlier analysis, that is, the coefficient on the interaction variable is positive and statistically significant.

TABLE A1
Comparison of Coefficient Estimates from Separate Bivariate Probit Estimation of Each Equation in Appendix A to Joint Estimation of Both Equations Allowing for Correlation in the Error Terms

	Separate Bivariate Probit Estimates for Each Equation	Joint Estimation of Both Equations Allowing for Correlation in the Error Terms
First-Stage Equation for DC-type = 1 versus DC-type = 0		
Intercept	−0.64	−0.65
	(0.01)	(0.01)
SERV_IND	0.45	0.46
	(0.01)	(0.01)
LOGASSETS	0.11	0.12
	(0.01)	(0.01)
LOGPL	−0.11	−0.11
	(0.01)	(0.01)
Second-Stage Equation for CB = 1 versus CB = 0		
Intercept	−3.48	−3.78
	(0.01)	(0.01)
POST_RRA90	0.06	0.06
	(0.84)	(0.83)
EXFUND_RATIO	−0.23	−0.22
	(0.31)	(0.32)
(POST_RRA90)(EXFUND_RATIO)	1.07	0.99
	(0.03)	(0.03)
LOGPL	0.35	0.24
	(0.01)	(0.02)
LOGASSETS	0.30	0.33
	(0.01)	(0.01)
Correlation between error terms		0.60
		(0.09)

First-stage equation estimates a probit model for the choice to switch from a traditional defined-benefit (DB) plan to a defined-contribution-type plan (DC_type = 1, number of observations = 255) or to keep the traditional DB plan (DC_type = 0, number of observations = 315). The second-stage equation estimates a probit model for the choice of cash-balance plan (CB = 1, number of observations = 123) or a full-fledged defined-contribution plan (CB = 0, number of observations = 132). The estimates in column 2 allow for correlation in the errors of the two equations.

A potential criticism is that we use a random sample for the observations with DC-type = 0. However, estimating the joint model with different random samples consistently yields similar results. In each case, the coefficient on the interaction variable, (POST_RRA90)(EXFUND_RATIO) is positive and statistically significant. We also estimate the model restricting the sample of firms for which DC-type = 1 to be those with confirmed defined-contribution replacement plans as in Table 5. Again the results are consistent with those reported in the text. We also include a performance measure,

MEANROA, in each of the equations and the primary results do not change. Finally, we estimate the model using the Heckman-type procedure described in Van de Ven and Van Praag (1981) and also find that the coefficient on the interaction variable is positive and statistically significant.

APPENDIX B

Benefit Accruals Patterns in Traditional Defined-Benefit Versus Cash-Balance Plans

An important difference between a traditional defined-benefit plan and a cash-balance plan (and the source of much of the controversy surrounding cash-balance plans) is the pattern of benefit accruals over an employee's service with a given employer. With traditional defined-benefit plans, benefits are backend loaded, that is, a large percentage of total benefits are accrued at the end of an employee's career. In contrast, cash-balance plans typically have a more even accrual pattern.[28]

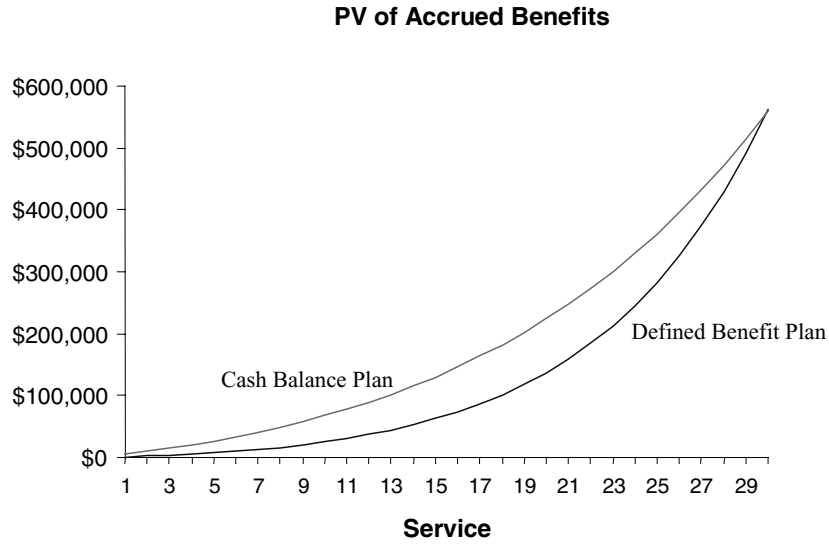
To illustrate the different accrual patterns, Figure A1 compares a hypothetical defined-benefit plan to a hypothetical cash-balance plan (with a constant salary crediting rate) with respect to the present value of accrued benefits. This comparison is made under the constraint that the present value of accrued benefits at retirement for an employee with 30 years of service is identical under the two plans. In the early years of service, employees accrue a relatively low pension benefit under a traditional defined-benefit plan compared to a cash-balance plan. Accrued benefits then grow at a higher rate under the traditional defined-benefit plan so that at the end of 30 years of service, the two plans provide the same level of benefits.

The effect of a conversion from a defined-benefit plan to a cash-balance plan on the value of an existing participant's retirement benefits depends on his/her years of service to date and his/her expectations regarding additional service. To illustrate, suppose that a sponsor converts the defined-benefit plan depicted in Figure B1 to the cash-balance plan, also depicted in Figure B1. In this case, the benefit formulas are set so that a newly hired employee who knows for certain that he/she will remain with the firm for 30 years would be indifferent between the two plans.

Existing participants, however, are unlikely to be indifferent. Suppose that the sponsor sets the initial account balance under the new cash-balance plan equal to the present value of accrued benefits under the old defined-benefit plan at the time of conversion. In other words, each employee's account balance begins with exactly the same amount (in present value terms) that the employee had accrued under the traditional defined-benefit plan. Following conversion, the account balance grows according to the cash-balance plan formula. Figure B2 illustrates the effect of conversion on an employee with 20 years of service (dashed line) and an employee with 6 years of service (dotted line). For the employee with 20 years of service, the conversion results in a lower present value of benefits than would have occurred if the employee stayed with the

[28] If a cash-balance plan increases the salary credit with years of service, the cash-balance plan could have a benefit accrual pattern that more closely matches a traditional defined-benefit plan.

FIGURE B1
Comparison of Defined-Benefit and Cash-Balance Plans with Respect to the Present Value of Accrued Benefits



Parameters are chosen so that the present value of accrued benefits is the same under both plans for an employee with 30 years of experience.

Assumptions:
Initial salary =$40,000
Salary growth rate = 4.0%
Interest rate = 6.35%

Defined benefit plan:
β = generosity parameter = 0.015, t = years of service, St = salary in year t, A = Cost of retirement annuity = $10 (lump sum of $10 converts to $1 of annual income for life), years to retirement = $T - t$
Annual benefit formula = 0.015 (final salary) (years of service)
Present value of accrued benefit at $t = (\beta\ \mathrm{A}\ \mathrm{S_{t-1}}\ \mathrm{t})/(1+\mathrm{r})\mathrm{T}-\mathrm{t}$

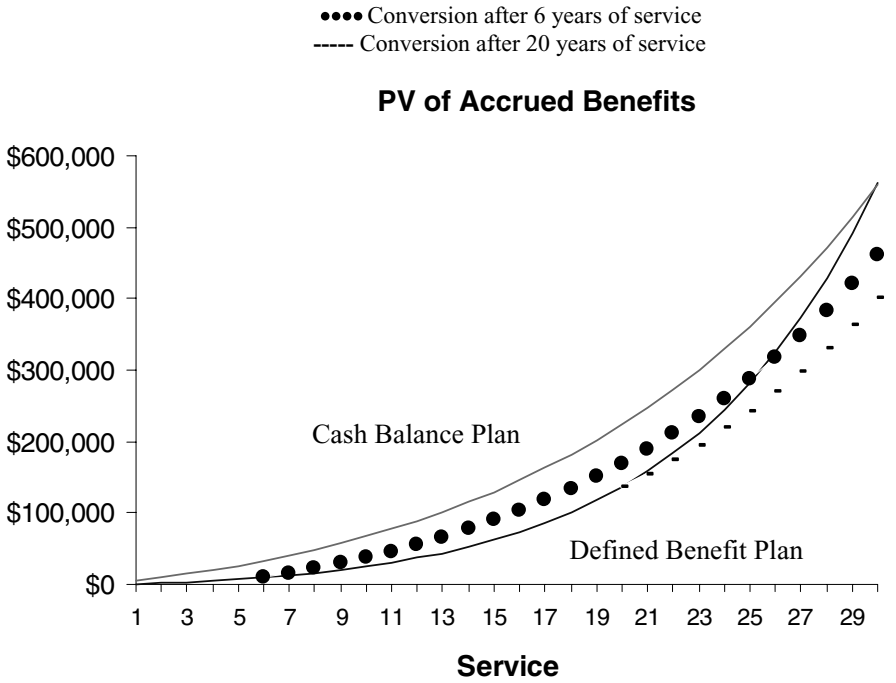
Cash balance plan:
c = salary crediting rate = 10%
r = Interest crediting rate = 6.35%
$\mathrm{PV}_t^{\mathrm{CB}}$ = present value of accrued benefit at $\mathrm{t} = \mathrm{PV}_{\mathrm{t}-1}^{\mathrm{CB}}\ (1+\mathrm{r}) + \mathrm{c\ St}$; where $\mathrm{PV}_0 = 0$.

firm under the traditional defined-benefit plan. This illustrates one way that cash-balance plan conversions can cause losses to older employees.[29,30]

[29] The disadvantage to older employees of converting to a cash-balance plan can be offset by either grandfathering their benefits under the old plan or by setting salary credits higher for older employees.

[30] In contrast to the previous analysis, under some conversions, the account balance initially is set lower than the present value of accrued benefits under the old defined-benefit plan, which might seem to violate ERISA's requirement that plan changes not reduce benefits that employees have already accrued. To conform to ERISA, in cases where the initial account balance is set lower than the accrued benefits, an exiting employee is entitled to benefits equal to the maximum of the present value of the accrued benefits under the old defined-benefit

FIGURE B2
Effect of a Conversion to a Cash-Balance Plan on the Present Value of Accrued Benefits



Parameters are chosen so that the present value of accrued benefits is the same under both plans for an employee with 30 years of experience.

On the other hand, younger employees who do not expect to be with the firm for many years are likely to prefer a conversion to a cash-balance plan, because it gives them a higher expected benefit. The dotted line in Figure B2 illustrates this result for the case of a conversion after an employee's sixth year of service. Provided the worker plans to leave the firm before 25 years of service, he/she is better off with the conversion. Thus, converting to a cash-balance plan could have a favorable impact on some groups of employees while hurting other groups.

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plan or the account balance under the new cash-balance plan. Consequently, for a period of time following the conversion, an employee's benefits are frozen at the level of accrued benefits at the time of conversion. This effect of cash-balance plan conversions sometimes is referred to as a plateau effect.

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