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LBOs, Reversions and Implicit Contracts

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ABSTRACT

The conventional view of going-private transactions is that they are designed to enhance the efficiency of the firm (for example, Jensen (1986)). A starkly different view is that these and other control transactions are motivated to effect transfers from other stakeholders in the firm to equity holders (Shleifer and Summers (1988)). This study exploits data describing pension terminations as a way to test these theories. We conclude that the efficiency theory can plausibly explain a substantial number of LBO-related terminations, but not enough to undermine the transfer theory. More specific predictions from the efficiency theory are needed to structure more exacting tests.

THE CONVENTIONAL VIEW OF going-private transactions is that they are designed to enhance the efficiency of the firm by removing impediments to firm value maximization (for example, Jensen (1986)). A starkly different view is that these and other control transactions are motivated to effect transfers from other stakeholders in the firm to equity holders (Shleifer and Summers (1988)). The study of pension terminations around these events is a way to test these theories.[1]

Pensions are normally seen as long-term implicit contracts between workers and firms. On occasion, however, these contracts are terminated, conferring large reversions on stockholders and equally large capital losses on workers. In an efficiency model, unilateral cancellations of implicit contracts are unavoidable actions taken by the firm to meet market exigencies. Thus, pensions are terminated because either the firm is in poor financial health, or recent changes in market conditions threaten the firm's long-term viability under existing contracts. Past studies have consistently found a relationship between pension terminations and various measures of firm difficulty (Hay Huggins (1986), Ippolito (1986), Mittelstaedt (1989), Thomas (1989), Stone (1987), and VanDerhei (1987)).

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[1] Another approach is to evaluate the impact of hostile takeovers on bond values (see, for example, Lehn and Poulsen (1988)).

In contrast, Shleifer and Summers (1988) formulate a model in which unilateral changes in contract provisions are interpreted as firms taking advantage of the implicit nature of contracts. For example, firms terminate pensions midstream to effect transfers from workers to shareholders. Their theory identifies takeover activity as a likely trigger for such transfers. In fact, at the heart of the transfer theory is the assertion that stock premia for LBOs are entirely attributable to the market's anticipation that the new structure will result in large transfers to stockholders. And indeed, various studies have found a link between pension terminations and either the existence of large potential transfers from the pension (Petersen (1989)), or the occurrence of control events, particularly leveraged buyouts (Mitchell and Mulherin (1988), Mittelstaedt (1990), Pontiff et al. (1990)).[2]

The purpose of this paper is to test the efficiency and transfer theories of LBOs by studying the relation between these events and pension terminations. The study uses a sample of LBO events in the 1980s. Owing to the large amount of data gathering required, the study is restricted to LBOs involving previously publicly traded firms taken private by the transaction (going-private transactions).

In section I, we explain how implicit pension contracts are structured, and how pension liabilities are reduced upon termination of the contract. The implicit nature of the contract presumably is meant to give the firm latitude in adjusting to changing market conditions over a lengthy contract period. In section II, we summarize the Shleifer and Summers (1988) model in which firms intentionally abuse the implicit nature of the contract to enrich stockholders. In section III, we discuss the data and variables used in the study, and, in the ensuing three sections, systematically evaluate the data for evidence consistent with either the efficiency or transfer theories of LBOs.

In particular, in section IV, we examine the relation between the existence of potential transfers from pensions and the likelihood of an LBO announcement. The measured relation between these variables is positive but weak. In section V, we evaluate the statistical relation between LBOs and subsequent pension terminations. The results show an unambiguous and strong causal relation. Some of these terminations clearly fall within the confines of a well-functioning implicit contract theory. The dominant type of LBO-related pension termination, however, is the one most consistent with a transfer theory. Thus, in section VI, we concentrate the analysis on these events, finding some but not complete support for the efficiency theory. In section VII, we conclude that many of the pension terminations in the sample can be explained within the context of an efficiency theory, but that the theory is insufficiently well developed to dominate the transfer theory as an explanation of pension terminations surrounding going-private transactions.

[2] The transfer motivation has been recognized in previous studies of reversions (for example, see Alderson and Chen (1986), Alderson and VanDerhei (1990), Harrington and VanDerhei (1987), Peterson (1989), Mittelstaedt and Regier (1987)). Also see Cornwell et al. (forthcoming), who take an entirely different approach to testing whether firms take advantage of implicit pension contracts.

I. Implicit Pension Contracts and Reversions

The technical aspects of a pension termination for reversion are not widely understood. Thus, in this section, we describe the implicit nature of the pension contract, show how pension terminations affect workers, and provide stockholders with asset reversions. The discussion is restricted to defined benefit plans which cover approximately two-thirds of pension-covered workers in the private sector (Beller and Turner (1990)). These are the only types of pensions that confer capital losses on workers upon termination.

The alternative to a defined benefit plan is a defined contribution plan which resembles a tax-preferred savings account (for example, see Ippolito (1990)). The firm deposits monies in accounts for each participant according to some preannounced formula. The accounts belong to workers after vesting occurs (which by law must be within 5 years).[3] Termination of a defined contribution plan imposes no losses on workers. Upon termination, all workers vest by law, and they retain the property rights to the full balance in their accounts. Thus, the firm has no opportunity to renege on its commitment midway through the contract, and no opportunity to obtain a reversion.

In contrast, termination of a defined benefit plan has a substantial impact on workers. To illustrate, consider a simple example.[4] A firm has one worker. He begins work with the firm at age 40, and has no expectation of quitting until he reaches retirement age, say 65. The firm pays part of its compensation in the form of a defined benefit pension that pays a lump sum amount at age 65 equal to 10% of wage at retirement age, times years of service. The worker's value marginal product is \$11 per year over his tenure, but his real cash wage is \$10. The real rate of interest is zero. At retirement age (65), the worker receives a pension worth \$25 in real terms (10% of the real cash wage of \$10, times 25 years of service), which is worth \$1 per year of service over his tenure with the firm. Thus, the worker ultimately receives his full compensation, but a portion is deferred in the form of a pension at retirement.

A problem can arise for pension-covered workers because much of the economic value of the pension promise is implicit. While the pension typically promises a benefit proportional to wages at retirement, the firm virtually always retains the right to terminate the plan. This flexibility is presumably included to help the firm meet business exigencies. If, however, the firm were to take advantage of the implicit nature of the promise, that is, to terminate the contract midstream solely for the purpose of cheating workers, a large transfer would be effected from workers to stockholders.

Upon termination, the firm is committed to pay pensions to workers beginning at retirement age. However, the benefit is tied to wages at the time the plan terminates, not wages actually earned at retirement age when the benefit is payable. Thus, even though all workers become vested by law upon termination, most workers absorb large capital losses.

[3] The period can extend to 7 years if the firm awards partial vesting sooner than 5 years. In fact, most defined contribution plans vest workers within two years.

[4] More detailed explanations of pension contracts and terminations are found in Ippolito (1986, 1990), Pesando (1985), Sharpe (1976), and Treynor (1977).

For example, in the above illustration, suppose the expected wage growth and the interest rates are 10% per year, and the firm terminates the plan when the worker has attained age 55. If the pension had continued, the worker's nominal wage at age 65 is expected to be \$27.10 (\$10 increased by 10% per year). Based on his first 15 years of service, his pension is expected to be \$40.65 (10% of his projected wage times 15 years of service). Discounted to age 55 at the assumed 10% interest rate, its value is \$15, exactly the amount of real \$1 contributions over his 15 years of service.

In contrast, when the plan is terminated, the worker's pension at age 65 is proportional to his wage at age 55 when the plan terminated, not his wage at retirement age, 65. Thus, his expected pension at retirement age is \$15 (10% of his current wage, times 15 years). The discounted value of this amount at age 55 is \$5.50. The worker loses fully two-thirds of his pension.

Presumably, following the termination, workers would no longer agree to future unbonded implicit pension contracts. Either no pension plan would be used, and thus cash wages would increase, or a bonded pension would be offered. A bonded pension might be a defined contribution pension plan. But the one-time losses on past service in the now-terminated plan can be large.

Firms are required to fund salary-related plans on the basis of projected benefits at retirement. Thus, assets in the plan tend to track ongoing (projected) liabilities, and hence normally are well overfunded in a termination sense. For example, in the database used below, pension plans have funding ratios averaging 180% of termination benefits, which is consistent with pensions overall (Beller and Turner (1990)). If the pension is exactly fully funded in an ongoing sense, the reversion equals the difference between ongoing and termination benefits, and this perfectly reflects the amount of losses imposed on workers.

In the example, the plan is fully funded for its 55 year old worker if it has \$15 in pension trust assets to match the \$15 ongoing liability. Since the termination liability is only \$5.50, the capital loss to the worker is \$9.50, exactly the amount of excess assets in the pension at termination. In this case, the reversion amounts to \$9.50.

While excess assets seldom exactly match worker capital losses, funding rules are such that excess assets normally are expected to be unbiased estimates of these losses.[5] It is through this logic that reversions are often

[5] Some research efforts have employed direct estimates of ongoing liabilities (for example, Ippolito (1986), Petersen (1989)), although this approach itself introduces considerable error. We do not know which wage projection, turnover, mortality, retirement age, and other implicit assumptions (like future ad hoc COLA adjustments) are appropriate for each plan; and we do not know the age distribution of workers; thus, transformations of reported termination benefits to ongoing benefits based on a set of arbitrary assumptions introduces considerable error. If the actuary for each plan is making unbiased estimates of each assumption based upon the experience of each plan, his funding pattern and thus his build-up of excess assets will be an unbiased, if noisy, estimate of potential capital losses. This measure also is noisy because of volatility in investment returns in the fund and the use of flat benefit plans by some firms which ensure that capital losses exceed excess assets. None of the qualitative results in the study, however, rely on the notion that excess assets are a perfect measure of capital losses.

viewed as the flip side of capital losses imposed upon workers by pension terminations. The empirical work reported below uses this measure as a proxy for potential transfers available from the pension plan. It also recognizes, however, the reality that all pension terminations impose losses on workers, even if excess assets are zero.

Presumably, implicit contracts are used because it is not feasible to envision all the circumstances that could arise in which the contract can be honored.[6] If market exigencies arise, it is understood that these contracts might be terminated. While the conditions that warrant termination, by definition, are not defined, we can reasonably presume that they entail circumstances where the termination increases the chances of the firm's survival. Empirically, we are left only with the intuitive notion that pension terminations are more likely to meet the exigency test if they occur in firms exhibiting some difficulty in competing successfully in their markets.

II. A Transfer Theory of Reversions

While most theories of LBOs presume either some enhancement in efficiency or a significant reduction in tax liability (Kaplan (1989), Jensen (1986), Lehn and Poulsen (1989)), an entirely different theory is found in Shleifer and Summers (1988)). Two predominant characteristics of going-private transactions are, firstly, they confer large premiums to existing stockholders, averaging approximately 30–40% (DeAngelo, DeAngelo, and Rice (1984), Kaplan (1989), and Lehn and Poulsen (1989)); and secondly, they often follow threatened hostile takeover attempts (Lehn and Poulsen (1989)). Shleifer and Summers argue that the source of stockholder premiums in hostile takeovers is the transfer of wealth from bondholders, workers, and other "stakeholders" in the firm; and that the going-private transaction mostly does what the takeover firm otherwise would have done, had the attempt been successful.

In the transfer model, the firm performs most efficiently in an ex ante sense if some of its contracts are implicit. For example, in exchange for lower cash wages, the firm promises to pay pension annuities indexed to final wages at retirement. The promise is not explicit because the firm reserves the right to terminate the pension anytime, presumably to provide flexibility to meet unanticipated business exigencies.

This feature of the transfer model is not unusual. Implicit contracts are common in economic models of the firm, but the literature generally presumes that the contracts are secured by bonds (P. Ippolito (1990)). The bond might take the form of reputational value. Thus, if the firm terminates its pension for no reason other than to cheat workers, the loss in reputational value in labor markets more than offsets the gain to the firm from cheating workers of their promised pension benefits.

[6] We can suppose that in return for facing this contingent loss, workers receive some wage premia. Thus, total compensation in the above example would actually exceed $11.

The unique feature of the Shleifer-Summers model is that implicit contracts are not bonded. Instead, they are secured by the firm's management who are trained to act in a mechanical fashion to protect the integrity of implicit contracts. Presumably, the cost of hiring and training "trustworthy" managers is lower than the cost of erecting bonds. In this model, when the cost of takeover falls (say due to the creation of innovative junk bond pools financed by large institutional investors), a large transfer is obtained if unscrupulous new investors abandon implicit promises made by previous management. In the future, these firms cannot credibly offer implicit contracts unless they are fully bonded. But presumably the one-time gain from breaking old contracts exceeds the additional future bonding costs in this model. Otherwise the takeover is not profitable.

In this model, existing management is tenacious in resisting hostile takeover attempts. And in principle, the theory might explain the concept of leveraged buyouts, particularly those in which management initiates the transaction after a takeover attempt (a "hostile" LBO). That is, an LBO might be effected to protect implicit contracts in the firm. But if this were so, it would be hard to explain the premiums affiliated with LBOs. Since management presumably does not break implicit contracts, the transfers that generate premiums in the Shleifer-Summers model do not materialize. Moreover, it is hard to explain how management can outbid new investors who would profit from terminating implicit contracts.

One explanation that reconciles the Shleifer-Summers model with LBO-stock premia is that the old equilibrium may have been disturbed following the financing innovation implied by the creation of junk bond pools during the 1980s. In the new environment, presumably some "trustworthy" management, faced with the reality that implicit contracts can no longer be protected, might participate in an LBO. In exchange for their cooperation, the new investors presumably agree to share the gain with the old management.

This version of the model explains why premiums are affiliated with LBOs. It also implies, however, that following LBO events, firms ought to be observed breaking implicit contracts. Pension terminations appear to offer a classic opportunity for shareholders to cheat other stakeholders in the firm. If the implicit pension contract is not bonded—that is, it is protected only by the "trustworthiness" of existing managers—an opportunity arises for new investors to expropriate a transfer from workers. Recognizing the futility of their position in the new financing environment, some managers might agree to participate in the breaking of the pension contract.

In contrast, an implicit contract theory is more amenable with an efficiency theory of LBOs. In this model, the takeover attempt more likely occurs because of inefficiencies in the firm, or the failure of the firm to adapt to new competitive conditions. In this model, a pension termination is more likely to occur in a firm that either encounters financial difficulty, or fails to adapt to changing competitive conditions. We refer to this alternative as the implicit contract theory of pension terminations.

III. Description of the Sample and Data

We now turn to an empirical analysis of going-private leveraged buyouts and pension terminations. The sample of LBOs is taken directly from Lehn and Poulsen (1989), with the exception of a few updated changes they provided us. Their sample includes all leveraged buyouts from 1980 through 1987 that involved a previously publicly traded company taken private by a leveraged buyout. There are 278 LBOs in their sample.

Lehn and Poulsen also use a control group in their study. For each LBO event, they select a second firm from the same 4-digit SIC industry in the Compustat database. If there is more than one firm, they select the one closest in size to the LBO (measured by sales). If any of the control-group firms themselves are the subject of a takeover attempt during the period (based on the *Wall Street Journal* Index), the authors replace them with alternative selections. This algorithm generates some cases where the same control firms appear several times in the data. We omit the duplicate data, leaving us with 220 control firms. All financial data is either taken from the Compustat database, or provided directly by Lehn and Poulsen.

The corresponding pension data for these firms are taken from the Pension Benefit Guaranty Corporation database. For each of the 498 firms in the sample a list of wholly owned subsidiaries is taken from the *Directory of Corporate Affiliations* during each year of the sample period.

For each parent and subsidiary, a name search is done of the universe of annual pension plan reports submitted to the U.S. Treasury (so-called 5500 forms) to find their employer (tax) identification numbers (EINs). All defined benefit plans covering at least 100 participants sponsored by firms in the sample are extracted from the data tape for each year from 1980 to 1986. A computer program was written to locate pension plans sponsored by the sample firms but which changed EIN numbers over the period (for example, changes attributable to LBO events).[7]

Many of the firms in the sample sponsor either defined contribution plans or contribute to a multi-employer pension plan. These plans provide no opportunity for the firm to impose losses on workers from termination of the pension, and thus are not the focus of our study.[8] Other firms sponsor a defined pension plan sufficiently small (fewer than 100 participants) so as to escape the requirement to submit a Form 5500 annual report.[9] The

[7] When pension plans change their tax identification numbers, or merge with another pension plan, they are required to report this information on the next 5500 form they submit to the Internal Revenue Service.

[8] In defined contribution plans, workers own the balances in the fund. Even unvested workers are automatically vested upon plan termination. Multiemployer funds (like the Central States Teamsters Fund) are a single pension plan funded by many firms; all contributions to these funds are irrevocable.

[9] Pension plans with fewer than 100 participants are subject to a tri-annual reporting system; and the data are not edited.

remaining 169 LBO firms and 116 control firms sponsor 1,460 defined benefit plans (each with at least 100 participants) during one or more years over the sample period. Excess assets in the average plan are approximately 3% of the firm's equity. When cumulated across multiple pension plans within firms, they represent approximately 10% of equity. These observations provide the basis for the empirical work.

From these data, legal excess assets are calculated for each pension plan: They are defined as the market-valued assets in the trust fund, minus termination liabilities. Termination liabilities are calculated using average 10-year U.S. Treasury bond rates prevailing during the relevant year.[10] The average termination funding ratio in the sample is 180%.

Pension terminations are identified for each firm in the sample over the period 1980–1988, using the PBGC's Case Processing File.[11] In total, 183 of the plans in the sample terminate during the sample period, 169 with reversions.

Financial and pension plan data for each firm are assembled for each year of the sample period, thereby creating a longitudinal database. Thus, we are able to exploit variation in the time-series data for the study as well as the cross-section data used in Lehn and Poulsen (1989).

Of the 183 plans that terminated over the sample period, 46 cannot be included in the time-series analysis because they lack sufficient financial data. Only 2 of these terminations are affiliated with control firms and 5 with LBO firms prior to LBO announcements. Fully 37 were effected by LBO firms two or more years following their LBO announcement. Since we do not have Compustat data following going-private transactions, we cannot match financial characteristics to these termination events. Hence, our time-series regressions are limited to the study of pension terminations proximate to the LBO announcement date; namely, those occurring either in the year of the announcement or the year after.

While this restriction is not expected to bias our measures of terminations around LBO announcement dates, it undercounts the total number of pension terminations that might be reasonably related to LBO events. After excluding these observations, there are 6,384 pension plan observations to study, including 137 termination events.[12] In the cross-section regressions reported below, we verify that inclusion of pension terminations beyond one year of the event does not materially change the results based on terminations proximate to the announcement date. Table I summarizes selected character-

[10] We converted termination liabilities as reported on Schedule B (question 6) in the Form 5500 Annual Pension Plan Report to a common interest rate using the algorithm presented in Ippolito (1986, p. 65).

[11] Because we did not have annual pension reports for small plans under 100 participants (see footnote 9), we also did not include termination observations for these plans. However, the ratio of terminations for small plans in the control versus LBO group were almost identical to those found for larger plans.

[12] One termination was omitted owing to lack of data for its control firm sponsor around the date of the termination.

Table I

Selected Sample Characteristics

The sample of LBOs and control firms from the same industries is taken from Lehn and Poulsen (1989). Our study includes 169 LBOs and 116 control firms over 1980–1987. Pension terminations are included through year $t + 1$ (where t is the LBO announcement year). Terminations are distributed by type: those replaced by (1) a similar or identical defined benefit plan (reestablishments), (2) a defined contribution plan (DC follow-ons), and (3) no new plan (usually affiliated with a sell off or plant closing). Excess assets are amounts in the pension fund beyond those needed to pay benefits upon immediate termination. LBO premium is the average premium (in percent) associated with LBO events in the sample, as estimated by Lehn and Poulsen (1989). Other data are taken from the PBGC Case Processing File and Form 5500 Annual Pension Plan Reports.

Independent Variable	Non-terminations (1)	Reestablishments (2)	DC Follow-ons (3)	No New Plans (4)	All Terminations (5)
Pension terminations					
LBOs (thru $t + 1$)	—	22	27	40	89
Controls	—	11	13	24	48
Total	—	33	40	64	137
Excess Assets/Equity (%)					
Per pension-LBOs	2.5	4.6	9.2	3.6	5.7
-Controls	3.0	16.1	9.2	.5	7.1
Per firm -LBOs	10.3	7.2	14.1	3.3	9.9
-Controls	9.6	18.4	12.9	.8	10.5
LBO Premium (%)	33.9	39.3	25.7	48.9	37.8
Number of Def. Ben. Plans -LBOs			977		
-Controls			483		1,460
Number of Sponsoring Firms -LBOs			169		
-Controls			116		285
Pension-year observations -LBOs			3,932		
-Controls			2,452		6,384

istics of the sample (data describing pension termination types are discussed below).

IV. Role of Excess Assets in the LBO Decision

As a starting point for the empirical work, we evaluate the determinants of LBO events. Our analysis is fashioned after the model used by Lehn and Poulsen (1989), although our data are slightly different.[13] They analyzed their LBO and control firms on a cross-section, using data pertaining to the

[13] Owing to updates in the LBO group and in the Compustat data since the Lehn-Poulsen was completed, our sample and data are somewhat different. In addition, we did not include duplicate observations of control group firms. And we used Compustat data from the year immediately preceding the LBO announcement date for both the LBO and its control firm counterpart, which is somewhat different than the algorithm used by Lehn and Poulsen. They used data from a period no closer than 6 months to the announcement date, and no further than 18 months prior to the announcement date.

year prior to the LBO date. We use a version of their model to test the transfer theory of LBOs. In the Shleifer-Summers theory, the raison d'etre for hostile takeovers, and by implication LBOs, is the existence of potential transfers.

In the pension context, the theory suggests that the likelihood of an LBO is related to the potential to impose capital losses on workers. In our sample, a good proxy for this potential is a dummy variable equal to unity if excess assets are available in the firm. Fully 274 firms out of 498 in our sample either do not sponsor a defined benefit plan, or sponsor one of de minimus size (fewer than 100 participants). Among the defined benefit plans in the database, over 80% have excess assets. Thus, the excess assets dummy variable is largely a measure of whether the firm sponsored a defined benefit plan.

In addition, it is desirable to include some measure of the importance of this transfer. For reasons discussed above, excess assets normally are highly correlated with the capital losses that would be imposed on workers upon termination of a pension. We thus include a variable equal to excess assets variable in relation to the firm's equity value (as measured the year prior to the LBO announcement for both the LBO firm and its control-group counterpart in the sample). If the transfer theory is correct, presumably, the existence of defined benefit plans in the firm and/or large amounts of excess assets in relation to equity value would attract LBOs. Our first results, presented in column 2 of Table II, reproduce the essence of the Lehn-Poulsen results.

In the Lehn-Poulsen study, a dummy variable denoting a rumored or actual takeover attempt, as reported in the *Wall Street Journal* during the year prior to the LBO announcement date, plays an important role in the LBO decision (they labeled this variable "footsteps"). Our analysis confirms their finding: The coefficient on the threatened takeover variable for our sample is positive, large, and highly significant. The results are consistent with the notion that going-private transactions preempt hostile takeovers.

Since their main emphasis is on testing an excess cash flow theory of LBOs, Lehn and Poulsen include excess cash flow in the firm divided by equity as a principal variable. They include the firm's tax liability relative to equity on the assumption that firms with insufficient taxable income cannot profitably issue large amounts of additional debt. They also include the firm's recent sales growth on the assumption that excess cash is less likely to be available for discretionary use in rapidly growing firms. The estimated coefficients on these variable are similar to those reported by Lehn and Poulsen.

Column 3 presents the results of the same regression, except it includes the excess pension asset variables. Neither pension variable exhibits a statistically significant effect on the decision to effect a leveraged buyout. Thus, if there is a relation between LBOs and pension excess assets, it is created after the LBO announcement.

We also estimate the regressions including selected additional variables characterizing the firms in the sample (column 4). We include the firm's

Table II

Determinants of LBOs, LBO Premia, and Takeover Attempts

The sample of LBOs and control firms from the same industries is taken from Lehn and Poulsen (1989). Regressions are based on cross-section data over the period 1980–1987, centered on the year in which the sample firm announced its LBO: year t (including control group firms in the same years). The dependent variables equal (1) unity for LBO firms and zero for control firms (cols. 2–4), (2) percent premium affiliated with the LBO (col. 5), and (3) unity if a rumored or actual takeover attempt is reported in the *Wall Street Journal* in the year prior to the LBO (takeover threat) (col. 6). Estimates in columns 2–4 and 6 are based on a logistics equation; reported parameters are point estimates: $b_i = c_i p(1 - p)$, where c_i is the estimated coefficient on the ith variable, b_i is the corresponding point estimate, and p is the probability that the dependent variable in the sample equals unity. Estimates in column 5 are based on ordinary least squares. Independent variables are measured in year $t - 1$. Excess cash flow equals operating income minus interest, dividends and taxes (plus the change in deferred taxes). Excess assets are amounts in the firm's pension fund(s) beyond those needed to pay benefits upon immediate termination (included as a continuous variable and a dummy variable for positive values). The current ratio equals current assets divided by current liabilities, and union percent is the portion of the workforce covered by a collectively bargained pension. Numbers in parentheses are t-statistics. Data are taken from Lehn and Poulsen (1989), Compustat, the PBGC Case Processing File, and Form 5500 Annual Pension Plan Reports.

Independent Variable	Means‡ (1)	LBO (2)	LBO (3)	LBO (4)	LBO Premium (5)	Takeover Threat (6)
Intercept		.40	.36	.30	.30	.31
		(2.38)	(3.50)	(3.01)	(6.00)	(2.27)
Takeover Threat	.29	.38***	.39***	.37***	.025	—
		(6.32)	(6.34)	(5.80)	(.74)	
Excess Cash Flow/ Equity	.10	.041	.044	−.10	.017	−.097
		(.43)	(.47)	(.70)	(.20)	(.92)
Taxes/Equity	.06	1.18***	1.20***	1.51***	.16	−.46
		(2.81)	(2.84)	(3.09)	(.64)	(1.13)
% Sales Growth (2 years)	.14	−.157*	−.154*	−.078	.14**	−.07
		(1.79)	(1.73)	(.98)	(2.01)	(.93)
Excess Assets > 0	.57	—	−.001	.024	−.05	.084#
			(.00)	(.40)	(1.33)	(1.58)
Excess Assets/ Equity	.07	—	−.14	−.310	−.07	.165#
			(.46)	(1.38)	(.51)	(.97)
Current Ratio	2.66	—	—	−.002	.004	−.041**
				(.38)	(.48)	(2.01)
Debt/Market Equity	1.37	—	—	−.031*	−.002	.001
				(1.79)	(.19)	(.04)
Book/Market Equity	1.02	—	—	.16***	.04	.032
				(3.92)	(1.26)	(.79)
Union %	.11	—	—	−.041	.10	.25**
				(.37)	(1.45)	(2.46)
Log likelihood (R-sq. col. 5)		578.67	578.10	520.06	.043	491.30
Mean dep. var.		.56	.56	.56	.36	.29
Observations		466	466	429	242	429

*, **, *** denote significance at the 90%, 95%, and 99% level using the two-tail test.

The sum of these coefficients is statistically significant at the 95% level of significance.

‡ Means based on 429 observations.

current ratio as a measure of liquidity, its debt-to-equity ratio as a measure of the cost of issuing more debt, its market-to-book equity ratio as a crude measure of market's assessment of management efficiency, and the percent of the firm's work force unionized. The union variable is motivated by both the transfer and efficiency theory of LBOs.

Shleifer and Summers portray unions as a likely target of transfers because union workers typically earn supracompetitive wages (for example, Ashraf (1990)) which provides a potential for a transfer from workers to stockholders. The same variable, however, is important to an efficiency theory of LBOs because the presence of supracompetitive wages portends future competitive problems for the firm. Thus these kinds of firms might be more likely to be the subject of wage restructuring to ensure the long-term viability of the firm.

The results inclusive of these variables are reported in column 4 of the table. The coefficient on the book-to-market equity ratios is positive and statistically significant (99% level), and the coefficient on the debt-to-equity ratio is negative and significant at the 90% level of confidence. The union variable, however, is not significantly different from zero. The basic Lehn-Poulsen results are not affected by inclusion of the additional variables.

Column 5 reports the results of the same regression as reported in column 4, except that the LBO premium (in percentage terms) is used at the dependent variable (the premia are estimated by Lehn and Poulsen (1989)). The regression is estimated by ordinary least squares. Again, there is no statistically significant relationship between LBO premia and excess pension assets. Nor are LBO premia related to the takeover attempt variable at any reasonable level of confidence.

These tests, however, arguably are biased to reject the transfer theory because one of the independent variables is the takeover threat. LBOs following takeover threats are at the core of the Shleifer-Summers theory: If takeover attempts occur where large transfers are available, and LBOs are triggered by these attempts, the impact of excess assets is reduced by inclusion of the takeover attempt variable. To check this result, we estimate the regression using takeover attempt as the dependent variable (column 6).

In this equation, the coefficients on both excess asset variables are positive and, although each itself is not statistically significant, their sum is significant at the 95% level of confidence.[14] Thus, the result offers some support for the transfer hypothesis.[15] At the same time, the magnitude and significance

[14] For the statistic, $z = x + cy$, the variance is

$$V(z) = V(x) + c^2 V(y) + y^2 V(c) + 2c\mathrm{Cov}(x, y),$$

where $V(i)$ is the variance of i, x is the coefficient on the excess assets dummy, y is the coefficient on excess assets/equity, and c is the mean value of excess assets/equity. The calculation yields a value of $t = z/V(z)^{1/2} = 2.62$. Another way of demonstrating this significance is to include only the excess assets dummy variable. In this case, the coefficient on this variable has a t-value of 2.22.

[15] An alternative is to use a dummy variable equal to unity if the firm sponsored a defined benefit plan. This approach provides an opportunity to pick up potential pension losses even if excess assets equal zero. We find essentially the same qualitative results using this alternative.

of the results are inconsistent with the hypothesis that excess assets are a dominant factor in attracting either LBOs or takeover attempts. Evaluated at its mean value, the estimated impact of excess assets on takeover threats is .095. The mean value of the dependent variable is .29.

Transfers, however, can take many forms, and if most of the transfer sources are omitted as independent variables in the regressions, the standard errors on the excess asset variables are quite high, thereby reducing the power of the tests. Further, the coefficients themselves may be biased owing to the omission of other variables that might be correlated with excess assets. One way to exploit the pension data more efficiently is to concentrate the study on pension terminations and ask whether LBOs increase the likelihood of terminations around LBO dates.

V. Impact of LBOs on Pension Terminations

In this section, we consider the probability that a firm in the sample effected a pension plan termination over the period 1980–1988. The sample comprises all defined benefit plans sponsored by the firms in the sample during any year in the period.

Our first estimates are based on a fixed-effects model which exploits the time-series variation in the data. We assume that the error terms are most likely to be correlated across CUSIP observations, that a decision to terminate one pension plan might be related to decisions by the same plan sponsor to terminate other plans within the same CUSIP. Thus, we include a separate dummy variable for each CUSIP in the sample.[16] The results are presented in Table III, column 1. The model is estimated using ordinary least squares. Numbers in parentheses are *t*-statistics.[17]

[16] Alternative estimates using a fixed-effects model with dummy variables for each pension plan yield similar results.

[17] Applying the logistics estimation to the fixed-effects model eliminates all the plan observations, except those that were terminated during the period. This option is not feasible in our database owing to the small likelihood of observing terminations. Our results are based on unweighted least squares which can create problems. A linear specification might seriously bias the estimated coefficients, and owing to heteroscedasticity, can lead to inconsistent standard errors. Running weighted least squares corrects the standard errors and provides a test for our linear specification. But since our predicted probabilities are so small, negative predicted variables are present which makes it impossible to run weighted least squares on all the data. Also, the option of assuming a correct specification and reporting corrected error terms (White (1980)) is not feasible because the adjustment uses fourth powers which cannot be handled in a regression with well over 300 variables.

We could, however, construct a test to determine whether our linear specification created serious bias in either the coefficients or standard errors. In particular, we reestimated the equations by OLS including all observations with a predicted value greater than zero. These results were qualitatively similar to those reported in the table. We then ran a weighted least squares regression on these same data, using as weights the inverse of the standard error on each predicted variable: $\text{weight}_i = 1/[\,p_i(1 - p_i)]^{1/2}$. The results are not materially different either in magnitude or levels of significance, and so not affect the qualitative conclusions derived from the unweighted results.

It is apparent that going-private transactions and pension terminations are related. The coefficients on the dummy variables denoting the year of the LBO announcement and the year after are positive, and the coefficient on the lagged variable is statistically significant at the 99% level of confidence. The coefficients on both interaction terms between the LBO dummy variables and excess assets are statistically significant, and the magnitude of the effect is also large. The results suggest that an LBO more than doubles the probability of a pension termination during the year of the announcement and the following year.[18]

These results are qualitatively similar to those reported in Pontiff et al. (1990), and are at least broadly consistent with the notion that LBO events could be intertwined with transfers. The transfer theory, as well as the implicit contract theory, however, can be tested more rigorously by separating the pension terminations into various categories.

Pension terminations are not all alike. Some are more consistent with the transfer theory. Others arguably are more consistent with the implicit contract theory. We start by considering the latter groups, then move to terminations that are harder for the implicit contract theory to explain. The type of each termination is determined by examining the annual pension plan reports filed by the plan sponsor before and after the termination, and the termination files in the PBGC's Case Administration System.[19]

A. Reestablishments

Reestablishment terminations are unlikely candidates for the transfer theory.[20] In these transactions, the firm terminates the pension, pays off termination liabilities, and takes the reversion. Following the transaction, it reestablishes the same plan, and awards past service credit, so that all promised benefits are paid off in proportion to wages at retirement.[21] For each reestablishment in our sample, we verified that past service credit was

[18] The predicted probability for no LBOs (P_0) is derived from calculating the average predicted probability, assuming that LBO_t and LBO_{t-1} equal zero. It is recalculated setting the same variables equal to unity (P_1). Since the latter calculation yields a two-year cumulative probability, it is divided by two to convert it to a per annum number. The LBO effect is measured as $P_1 - P_0$. The text expresses the results in terms of the ratio of the two probabilities (P_1 / P_0). If a coefficient on an LBO term was insignificantly different from zero at the 90% level of confidence, its value was set to zero.

[19] In some cases, when the documents were not sufficiently clear, we phoned either the plan sponsor or its pension service provider to obtain more detail.

[20] Other kinds of events known as "spinoffs" work in a different technical way but have the same economic properties as reestablishments. In spinoffs, the plan is separated in two, one for retirees and one for workers. All the excess assets are transferred to the retiree plan which is then terminated. The plan covering active workers is unaffected.

[21] To avoid overpaying workers, the new and terminated plans are "integrated" so that the total pension awards of both plans do not exceed the amount promised under the old plan, had it continued. See Hay Huggins (1986).

Table III

Impact of LBOs on Terminations and Reversions

The sample of LBOs and control firms from the same industries is taken from Lehn and Poulsen (1989). Regressions are based on cross-section time-series data over the period 1980–1987. The dependent variable in columns 2–5 equals unity if a termination of type j occurred in year t, zero otherwise. Termination types are those replaced by (1) a similar or identical defined benefit plan (reestablishments), (2) a defined contribution plan (DC follow-ons), and (3) no new plan (alternatively, affiliated with either a sell-off or plant closing). Column 1 aggregates all types of terminations. Independent variables are measured in year $t-1$. Excess assets are amounts in the pension fund beyond those needed to pay benefits upon immediate termination. LBO_t is a zero-one dummy variable equal to unity if the pension sponsor announced an LBO in year t. Excess cash flow equals operating income minus interest, dividends and taxes (plus the change in deferred taxes). The current ratio equals current assets divided by current liabilities and no-tax-last-year is dummy variable equal to unity if the firm paid no taxes. All estimates are fixed effects based on ordinary least squares. Numbers in parentheses are t-values. Data are taken from Lehn and Poulsen (1989), Compustat, the PBGC Case Processing File, and Form 5500 Annual Pension Plan Reports.

Independent Variable	All Terminations (1)	Reestablishments (2)	DC Follow-ons (3)	Plant Closing (No new plan) (4)	Sell-off (5)
Excess Assets/	.015	.030***	.010	−.022*	−.004
Equity (EA/EQ)	(0.68)	(2.78)	(0.90)	(1.69)	(0.46)
LBO_t	.012	.005	.003	.004	−.000
	(1.49)	(1.38)	(0.66)	(0.86)	(0.17)
LBO_{t-1}	.023***	.012***	.013***	−.001	−.001
	(2.67)	(2.76)	(2.81)	(0.20)	(0.18)
LBO_t* EA/EQ	.36***	.09**	.27***	−.006	.001
	(3.90)	(2.05)	(5.57)	(0.10)	(0.04)
LBO_{t-1}* EA/EQ	.50***	.14**	.22***	.15**	−.000
	(4.49)	(2.44)	(3.70)	(2.27)	(0.12)
Sales Growth	−.023*	−.001	−.018**	.001	−.005
(2 years)	(1.68)	(0.15)	(2.42)	(0.10)	(1.04)
Excess Cash Flow/	−.001	−.008	.005	.001	.001
Equity (ECF)	(0.07)	(1.51)	(0.83)	(0.22)	(0.27)
No Tax Last Year	.004	.009**	.004	−.006	−.003
	(0.59)	(2.56)	(1.05)	(1.38)	(1.13)
Current Ratio	.010***	.000	.003**	.007***	.001
	(4.47)	(0.00)	(2.11)	(5.15)	(0.73)
Debt/Market	.001	.000	.000	.000	.000
Equity	(0.78)	(0.34)	(0.54)	(0.47)	(0.14)
Book/Market	−.002	.000	−.002	−.002	.001
Value	(0.64)	(0.13)	(0.92)	(0.74)	(0.61)
Total Assets	−.002	−.002	−.000	−.001	.003***
($1,000)	(0.57)	(1.56)	(0.65)	(0.86)	(2.85)
Year and firm dummies	×	×	×	×	×
R-squared	.12	.10	.16	.09	.03
No. Terminations	137	33	40	47	17
Observations	6,384	6,384	6,384	6,384	6,384
Prob. of Termination	.0215	.0052	.0063	.0074	.0027

*, **, *** denote significance at the 90%, 95%, and 99% level of confidence (two-tail test).

granted in the follow-on plan.[22] The design of reestablishments seems to be deliberately arranged so as to give the firm access to monies in the pension fund without, at the same time, imposing capital losses on workers.[23, 24]

Reestablishment transactions themselves are an interesting topic of study (see, for example, Harrington and VanDerhei (1987), Mittelstaedt (1989), and Thomas (1989)). For our purposes, however, they are important because they are inconsistent with the transfer theory. Firstly, these transactions do not impose capital losses on workers; and, secondly, even if they did, it would be peculiar to observe the creation of another implicit pension contract, following the termination of its predecessor (see discussion in section II).

Reestablishments reflect overt attempts by firms to preserve the promised pension benefits, and thus are consistent with the implicit pension contract theory. Indeed, if all LBO-related terminations were reestablishments, there would be little for the transfer theory to explain.

Of the 137 terminations in the database, 33 are reestablishments. To gauge the impact of these events on the LBO results reported in Table III, column 1, we rerun the regression using a dependent variable equal to unity for reestablishment terminations, zero otherwise (column 2). The zero category includes all plans that never terminated over the period (over 90% of the observations), as well as plans that terminated over the period, but are not reestablishments. This procedure is followed for each type of termination analyzed, so that the probabilities are comparable across the table.[25]

The results show that a portion of the LBO-reversion relation in column 1 is attributable to reestablishments around LBO dates. The estimates suggest that if a firm goes private, its probability of effecting a reestablishment more than triples during both the LBO announcement year and the year after.[26] These results are inconsistent with the notion that pension terminations occur to effect transfers from workers to stockholders. Obviously, some other factors besides intended transfers influence at least some LBO-related terminations.

B. Plant Closing and Sell-off Terminations

Another plausible explanation for the observed LBO-pension termination relation is that LBOs might be affiliated with a disproportionate amount of

[22] We could not verify past service in three cases. Since we could verify past service for all the remaining reestablishments, we assumed these plans also gave past service credit.

[23] Federal pension law prohibits the firm from borrowing directly from the pension, but permits reversions to revert to the plan sponsor even if the plan is reestablished.

[24] It is sometimes argued that these transactions do not completely insulate all participants in the pension from losses. For example, upon annuitization with the insurance company, it might be less likely that existing retirees will receive future ad hoc COLA increases that might be given to future retirees in the plan. As a first order approximation, however, it seems unlikely that a firm intent on effecting transfers to stockholders would eschew the major source of transfer (namely, denying past service credit in the new plan), and at the same time extract a relatively small amount from existing retirees.

[25] The results were essentially the same if the zero categories included only the plans that never terminated.

[26] This factor was calculated in the same manner as described in footnote 18.

plant-closing and sell-off activity. If so, this could generate an unusual number of pension terminations. Fully 64 of the 137 terminations in the sample report no follow-on plan. In 47 of these, the plan sponsor reported that the termination was attributable to a plant closing, liquidation, bankruptcy proceeding or "adverse business conditions"; and 17 reported that the termination was attributable to a sale or merger. We refer to these types of terminations as the plant-closing and sell-off groups.

If most LBO-related terminations are affiliated with these kinds of events, it is hard to make a convincing argument that the predominant reason for the termination is to effect a transfer from workers to shareholders. It is more likely that the termination is primarily attributable to restructuring decisions in the firm, events that plausibly fall in the exigency category in the implicit contract theory. To test the importance of these kinds of terminations on the overall LBO-reversion relation, we estimate regressions separately using a dependent variable equal to unity only if the termination is affiliated with a plant closing (column 4) or sell-off (column 5), zero otherwise.

The results show some positive relation between LBOs and plant-closing-related terminations, but the effect is small in relation to the overall LBO effect evinced in column 1. The results show no indication of LBO impacts on sell-off terminations. Most of the measured LBO impact on pension terminations is not explained by LBOs selling off divisions, or closing plants.[27]

C. DC Follow-on Terminations

The results for reestablishments and terminations affiliated with plant closings and sell offs suggest that a portion of the LBO-reversion relation measured in column 1 is plausibly explained by well-functioning implicit contracts. Reestablishments are designed as though the firm views the pension as an implicit contract, and explicitly designs the transactions to eliminate worker capital losses. Plant closings and sell-offs are at least broadly consistent with the exigency provision in the implicit contract notion. It is more difficult for implicit contract theory to explain a termination characterized by a defined contribution follow-on plan (DC follow-on).

Unlike reestablishments, DC follow-on terminations do not award past service credits. They provide contributions for future service only. Thus,

[27] We were able to confirm these findings using different data. The SEC provided us with the percent of assets sold off by most of the LBOs in the sample. We found no statistically significant relation between this variable and the occurrence of LBO-related terminations. We also tested a related hypothesis that LBOs might be consolidating pension plans following the event. We found no statistically significant evidence that the number of participants in ongoing plans sponsored by LBO firms increased inexplicably following terminations of other plans in the LBO. We also could find no evidence in the pension data of important layoffs in LBO firms. Layoffs will cause the number of active participants in ongoing pension plans to fall (they are reclassified as separated vested participants). We found no statistically significant decrease in active participants in ongoing plans following LBOs.

these types of terminations clearly foster significant capital losses for workers on all pension accruals prior to the date of the termination. Unlike terminations affiliated with plant closings and sell-offs, it is not as easy to explain these transactions as incidental to other major restructuring decisions in the firm. Indeed, these kinds of terminations most closely resemble the expected transfers predicted by Shleifer and Summers (1988). Of the 137 terminations in the data, 40 are DC follow-ons.

To measure the importance of these types of terminations around LBO announcements, we estimate a regression setting the dependent variable equal to unity for a DC follow-on termination, zero otherwise. The results are reported in column 3 in the table. It is apparent that there is a large impact of LBOs on DC follow-on terminations. The estimates suggest that the likelihood of observing a DC follow-on termination quadruples during the year a firm announces its going private transaction, and the year after.[28]

A summary of these results is presented in Table IV. Row 4 shows the estimated LBO impact on the per annum termination probability for all terminations and for each type of termination. The numbers show that DC follow-on terminations comprise approximately 60% of LBO-related pension terminations in the sample.

In short, the types of pension terminations most consistent with the transfer theory are disproportionately affiliated with LBO announcements.

Table IV

Estimated Probabilities of Pension Terminations

The sample of LBOs and control firms from the same industries is taken from Lehn and Poulsen (1989). Estimated termination probabilities are based on cross-section time-series data over the period 1980–1987. Numbers in row 1 are per annum pension termination probabilities in the sample (in percent). Those in rows 2a–2c are estimated annual probabilities based on fixed-effects regressions. The probabilities are reported separately by type of termination: those replaced by (1) a similar or identical defined benefit plan (reestablishments), (2) a defined contribution plan (DC follow-ons), and (3) no new plan (alternatively, affiliated with either a sell-off or plant closing). The numbers in columns 2–5 do not add exactly to those in column 1 owing to the nonlinearity of the estimates.

Category	All Terminations (1)	Reestablishments (2)	DC Follow-ons (3)	Plant Closings (4)	Sell-offs (5)
1. Mean prob. in sample	2.15	.52	.63	.74	.27
2. Predicted probabilities					
a. Full sample	2.09	.48	.62	.74	.24
b. No LBOs–P_0	1.72	.34	.41	.71	.23
c. LBOs –P_1	3.98	1.20	1.71	.91	.23
3. Difference $P_1 - P_0$	2.26	.86	1.30	.19	.00
4. Ratio P_1/P_0	2.31	3.49	4.17	1.27	1.00

[28] This factor was calculated in the same manner as described in footnote 18.

These transactions clearly warrant further attention to distinguish two competing hypotheses: that the breaking of implicit pension contracts around LBO announcements either (1) reflect underlying competitive problems faced by the plan sponsor, in which case the transactions plausibly fall within the exigency provision of implicit contracts; or (2) represent overt transfers from workers to stockholders, in which case they represent the opportunistic breaking of implicit contracts.

VI. DC Follow-on Terminations: Tests of Competing Theories

A. Efficiency Theory

If the firm replaces its defined benefit plan with a defined contribution plan because of serious financial difficulty, DC follow-on terminations would be explained by financial conditions characterizing these firms prior to the event. The fixed-effects model by its construction, however, measures the influence of the deterioration of financial variables prior to the LBO event. That is, the LBO relation is measured holding constant temporal changes in these variables. The question that arises is whether the implicit contract theory permits a legitimate pension termination under conditions that are not directly related to existing measures of financial stress.

The implicit pension contract theory, almost by its definition, is not well specified. If pension terminations are predictable under a given set of circumstances then presumably these conditions would be made explicit in the contract. Thus, the theory does not give clear guidance to empirical work.

Besides measures of the firm's financial health, we consider two potential factors that suggest legitimate terminations within a broader interpretation of the implicit contract theory. First, the nature of the LBO event might seriously constrain cash flow in some firms after the event, so as to threaten their viability. In these cases, firms and workers might be better off if the firms switch to a pension plan type with more flexibility in the timing and amount of contributions. Second, although the firm might not evince impending financial difficulty, the possibility exists that the firm is employing compensation practices inconsistent with prevailing industry standards, perhaps threatening the future competitive position of the firm.

A.1. Cash Flow Explanation

Petersen (1990) provides a rationale why some firms might switch to a defined contribution plan following an LBO announcement within the context of the implicit contract theory. Most defined contribution plans (over two-thirds) either set contributions as a function of profits, or contribute stock instead of cash into the pension. Thus, instead of committing actuarially determined cash contributions as in defined benefit plans, firms can retain more flexibility in their contributions by using defined contribution plans.

Firms usually face higher commitments of their cash flow following an

LBO owing to higher levels of debt. If the firm faces unusually tight projected cash flow, it might search for ways to gain flexibility on its cash commitments in the future.

To test this hypothesis, we project excess cash flow following the LBO. We set this variable equal to equal excess cash flow observed in the year prior to the event (as defined by Lehn and Poulsen (1989)), minus interest on new debt, plus dividends paid in the prior year on now-repurchased stock, plus some portion of taxes paid in the prior year.[29] We characterize the post-LBO cash constraint as this amount, divided by estimated post-LBO interest payments. [30, 31]

A.2. Efforts to Meet Competitive Conditions

It is not feasible to evaluate all aspects of firms' compensation packages against industry standards. But two features are readily identified which are suggestive of competitive problems in future periods. The first is a firm's use of a defined benefit plan when similar firms in the industry use defined contribution pensions. The second is the presence of unions in the firm which suggests the existence of supracompetitive wages.

Defined benefit plans are not optimal for all firms. They are effective contracts to enforce long tenure in the firm (for example, see Allen et al. (1989)). But these plans are more expensive to administer (Hay Huggins (1990)) and require wage premia to compensate workers for accepting the indenture implicit in the contract (Ippolito (1991)). One way to gauge whether it is optimal for a firm to offer a defined benefit plan is to ask whether similar firms in the industry also use these plans.

Our approach is as follows. We estimate the likelihood that in 1979 (prior to the sample period), a firm offering some kind of pension plan, offered a defined benefit type. The independent variables include dummy variables denoting size classes of the pension and firm, collective bargaining status of workers covered by the pension, and zero-one dummy variables denoting

[29] If projected taxable income after the event was negative, all taxes paid in the prior year were added back to cash flow. Otherwise, taxes were calculated on the basis of projected taxable income, taking into account interest deductions on new debt.

[30] The SEC provided us with the actual junk bond interest rates in 66 LBOs; Otherwise, we assumed the rate equaled the then-prevailing rate on Moody Baa bonds. For 82 of the LBOs, the SEC was able to give us information describing the debt-equity ratio after the LBO transactions; otherwise, we assumed that newly created debt equaled 80% of the market value of equity as reported in the year immediately preceding the event (roughly the average for the sample), plus the stock premium affiliated with the LBO. We calculated total debt as the sum of estimated new debt plus existing debt observed the year prior to the LBO.

[31] This is the variable used in the regression reported below, but we also tried other variables including (1) a dummy variable equal to unity if projected cash flow after the LBO was negative; (2) the range of cash flow in the firm during the previous 5 years relative to post-LBO interest payments; (3) the minimum contribution required in the pension plan relative to projected cash flow; and (4) the lowest cash flow over the previous five years, divided by post-LBO interest payments. Inclusion of these variables did not alter the qualitative nature of the conclusions.

sixty 2-digit industry codes affiliated with the plan sponsors.[32] The estimates are based on the universe data base of annual pension plan form-5500 report filings with the Internal Revenue Service (see, for example, Gustman and Steinmeier, forthcoming).

These coefficients are imported into the LBO database, permitting us to estimate the predicted probability that plans in our sample would be defined benefit or defined contribution plans, based on these same characteristics. The predicted probability $\hat{p}$ is used as an independent variable in the regressions. Our presumption is that the lower the predicted probability of offering a defined benefit plan, the less likely the defined benefit plan we observe is consistent with practices followed by other similarly situated firms, and thus the more likely it is to be terminated with a DC follow-on plan.

To ensure that DC follow-on transactions do not merely reflect changing patterns in these kinds of firms over the sample period, we also calculated the predicted probability of defined benefit coverage in 1987, and included the change in this variable from 1979 to 1987. Thus, our procedure measures changes in plan type, holding constant trends observed in similarly situated firms over the period.

We also consider the degree of unionization as another measure of competitive viability of the firm (measured by percent of its work force unionized). Schleifer and Summers also note a relation between takeovers and high union wages, and the possibility that takeovers occur to reduce this compensation. They view post-takeover wage reductions as transfers amongst stakeholders in the firm. But the union prediction is not unique to their theory. An efficiency explanation of LBOs portrays unionization of workers as a likely index of competitive difficulty.

It is well known that unions are affiliated with a large wage premium (roughly 33%; see, for example, Ashraf (1990)). They also are affiliated with pensions that are substantially more generous than those covering non-union workers (Gustman and Steinmeier (1986)). These conditions make unionized firms vulnerable to entry of non-union firms, a trend that clearly occurred over the period of the sample. During the 1970s, the percent of the work force unionized was stable: 23.6% in 1973 versus 23.8% in 1979. But by 1987, this share had fallen to 16.7% reflecting some serious disruption in union-intensive markets (Curme et al. (1990)). I have shown elsewhere that the probability of firm failure during the period 1978–1983 was positively and significantly related to the percent of the work force unionized (Ippolito (1986)).

In this context, DC follow-on terminations can be viewed as reductions in compensation levels. First, the firm's new defined contribution plans often is less generous (Hay Huggins (1986)). Second, the capital losses imposed on

[32] The analysis was restricted to primary plans only. These plans are identified by the U.S. Department of Labor, and classified accordingly on the tape. Defined benefit plans are almost always the primary plan, but many defined contribution plans are secondary plans covering the same participants. Secondary plans are ignored in the analysis.

workers by the pension termination in these firms finance part of the supracompetitive wage until wages themselves, are gradually reduced in real terms. Put another way, pension capital losses in highly unionized firms can be viewed as the forfeiture of a bond which promised to pay off its stated value on the condition that the firm remained viable at the higher union wages (Ippolito (1985)).

B. Transfer Theory

The transfer theory itself can be tested more rigorously by considering the specific LBO events predicted to effect transfers. Firstly, at the core of the transfer theory is the proposition that stock price premia affiliated with control events are attributable to the expectation that new owners will break implicit contracts. In this theory, LBOs are not intended to enhance efficiency, but to effect transfers.

To explain the stock premia that arise upon LBO announcements, it must be true that the market anticipates these transfers. Thus, when LBOs occur for which the market expects no transfers, no price premia develop. Those that promise large amounts of transfers generate large premia. Indeed, Mittelstaedt and Regier (1990) show that much of the stock premia affiliated with reversions are in reality attributable to announcements of control transactions around the same time as the reversion announcements. The stock price premia for our sample are estimated by Lehn and Poulsen (1989).

Secondly, the transfer theory suggests that firms with high management shares of stock ownership are likely to be less threatened by a takeover and thus less likely to mimic a hostile acquirer following an LBO. And thirdly, the theory predicts that hostile LBOs—those following threatened takeovers—are more likely to effect pension terminations that impose capital losses on workers.

C. Cross-section Tests

To test these ideas, we analyze the cross-section variation in the database around the year of the LBO. The defined benefit plan is the unit of observation. We wish to learn more about which of these plans terminate with a DC follow-on plan. The financial data pertain to the year prior to the announcement for LBO firms (except for projected cash flow following the LBO). For control firms, the data pertain to the year prior to the announcement for their LBO counterpart in the sample.

The cross-section analysis also permits us to verify the qualitative results based on time-series variation (Table III). And it provides an opportunity to verify that the exclusion of LBO terminations two years or more after the LBO announcement do not affect the qualitative results. In particular, the dependent variable is set equal to unity if the defined benefit plan is terminated with a DC follow-on replacement plan either during the year of the LBO announcement or any year thereafter (through 1988). Thus, the

number of pension terminations is different compared to Table III because (a) pre-LBO announcement terminations are excluded, but (b) terminations beyond one year of the announcement are included.

The zero category includes all defined benefit plans sponsored by firms in the sample in the year prior to the LBO announcement, and either are not subsequently terminated (the majority of the sample) or are terminated but are not a DC follow-on type (reestablishment, plant closing and sell-off). The qualitative results are the same if the zero category is restricted to plans that are not terminated. The estimates reported in Table V, column 2, are made using a logistics equation. The parameters reported in the table are point estimates, and the numbers in parentheses are *t*-statistics.

The first result of interest is that the coefficient on the predicted probability of defined benefit coverage in the firm is negative and large: firms offering defined benefit plans are less likely to engage in a DC follow-on termination if other similarly situated firms also use defined benefit plans. Compared to a plan characterized by the average predicted value of defined benefit plan coverage in the sample (.88), a plan with a predicted probability of unity is about 50% less likely to terminate with a DC follow-on, and one with a predicted probability of 50% is approximately twice as likely to terminate with a DC follow-on.[33]

Additionally, the coefficient on the union variable, measuring the percent of the firm's work force unionized, is positive, large, and statistically significant. In fact, further analysis shows that the union-DC follow-on relation is nonlinear. For firms within three categories—less than 25% unionized, 25–75% unionized, and more than 75% unionized—the likelihoods of observing a DC follow-on termination in the data are 2.4, 5.6, and 19.2 percent.[34] These results are consistent with plausible reactions of firms to conditions that are at least suggestive of longer term competitive problems, and thus are consistent with the exigency provision of the implicit pension contract.

It is also apparent, however, that even holding these factors constant, the LBO effect on the termination decision remains large and statistically significant. Compared to the control group, LBO firms are approximately 2.5 times as likely to engage in a DC follow-on termination following their LBO announcement. The implicit contract theory, even accounting for at least some aspects of disparate compensation packages, is not able to explain the LBO impact on DC follow-on terminations.

As a check on these results, we estimate regressions with the dependent variable equal to unity alternatively for reestablishments and terminations with no new plan (plant closings and sell offs). If our interpretation of the significance of the union and predicted defined benefit coverage variables is

[33] These results are based on calculating the predicted probabilities when the value of variable, predicted defined benefit coverage, is alternatively 100% and 50%.

[34] These results are based on a regression with two dummy variables in place of a continuous unionization percent. The coefficients (*t*-values) on the variables denoting less than 25% and more than 75% are −.039 (2.12) and .061 (2.38). The predicted probabilities are based on the alternative assumptions that all the observations fall into each category.

Table V

Cross-section Analysis of Terminations After LBO Announcement Dates

The sample of LBOs and control firms from the same industries is taken from Lehn and Poulsen (1989). Regressions are based on cross-section data over the period 1980–1987, centered on the year in which the sample firm announced its LBO: year t (including control group firms in the same years). Dependent variables equal unity if a pension plan is terminated and replaced by plan type j in year t or after. Termination types are those replaced by (1) a similar or identical defined benefit plan (reestablishments), (2) a defined contribution plan (DC follow-ons), and (3) no new plan. The independent variables are measured in year $t - 1$. LBO is a dummy variable equal to unity if the pension is sponsored by an LBO firm, zero otherwise. Excess assets are amounts in the pension fund beyond those needed to pay benefits upon immediate termination. Union percent is the portion of the firm's workforce covered by a collectively bargained pension plan. $\hat{p}$ (DB pension) is the predicted probability of defined benefit plan coverage in 1979 (based on universe pension plan data). Proj. ex. cash flow/interest is excess cash flow in the year prior to the LBO (operating income minus interest, dividends, and taxes, plus the change in deferred taxes) projected to the year after the LBO (add back dividends on repurchased stock, and some portion of taxes to accommodate new interest payments, and subtract interest on newly issued junk bonds), all divided by estimated interest payments on total post-LBO debt. Takeover threat is a dummy variable equal to unity if a rumored or actual takeover attempt occurred during the year prior to the LBO, and Mgmt. pct. own. is the percent of the firms' stock owned by management prior to the LBO. Other variables not reported in the table include (those significantly different from zero at the 95% level are shown in parentheses) the firm's total assets, debt-to-equity ratio (+, col. 3), excess cash flow, current ratio (+, col. 4), percent sales growth averaged over two years, book-to-market equity (+, cols. 4, 5) and a dummy variable equal to unity if the firm paid no taxes (+, col. 6). Estimates are based on logistics equations. Reported coefficients are point estimates; that is, $b_i = c_i p(1 - p)$, where c_i is the estimated coefficient on the ith variable, b_i is the corresponding point estimate and p is the probability that the dependent variable in the sample equals unity. Numbers in parentheses are t-statistics. All data are taken from Lehn and Poulsen (1989), Compustat, Form 5500 Annual Pension Plan Reports, and the PBGC Case Processing File.

		LBOs and Controls			LBOs Only DC Follow-ons	
Independent Variable	Means (1)	DC Follow-ons (2)	Reestablishments (3)	No New Plan (4)	$t, t+1$ (5)	All Post t (6)
Intercept		0.110	.102	.103	.196	.089
		(1.96)	(2.03)	(1.71)	(.72)	(1.45)
LBO firm	.65	.038**	.044**	−.003	—	—
		(2.17)	(2.42)	(.24)		
Excess Assets/ Equity	.031	.076	.084	−.28	.160**	.153*
		(1.32)	(1.28)	(1.55)	(2.47)	(1.70)
Union percent	.24	.111***	.030	.051*	.075**	.120**
		(4.11)	(0.92)	(1.84)	(2.31)	(2.82)
$\hat{p}$ (DB Pension)	.88	−.165***	.058	−.114**	−.178***	−.174**
		(3.59)	(1.18)	(2.53)	(3.24)	(2.25)
Chg. $\hat{p}$ 1979–1987	−.09	−.01	.054	.009	−.080	−.053
		(.03)	(.80)	(.14)	(1.10)	(.56)
Proj. Ex. Cash Flow/Interest	.62	—	—	—	.000	—
					(.00)	
Mgmt. pct. own.	.12	—	—	—	−.095	−.090
					(1.31)	(1.15)

Table V—(*Continued*)

Independent Variable	Means (1)	LBOs and Controls: DC Follow-ons (2)	LBOs and Controls: Reestablishments (3)	LBOs and Controls: No New Plan (4)	LBOs Only DC Follow-ons: $t, t+1$ (5)	LBOs Only DC Follow-ons: All Post t (6)
Takeover Threat	.64	—	—	—	.007	.025
					(.36)	(1.03)
Other variables		×	×	×	×	×
No. obs. positive		36	41	34	15	29
No. obs.		920	920	920	561	601
Mean dep. var.		.039	.044	.037	.027	.048
Log Likelihood		241.91	301.82	262.76	95.37	182.67

*, **, *** denote significance at the 90%, 95%, and 99% level using the two-tail test.

correct then the same variables ought not to predict reestablishments as well as DC follow-ons. The results in column 3 (reestablishments) confirm this expectation: the coefficients on these variables are insignificantly different from zero. Their significance reemerges for the analysis of no-new-plan terminations, suggesting that factors leading to plant closings and sell offs are similar to those influencing DC follow-on transactions. This finding is encouraging for the hypothesis that DC follow-on transactions reflect underlying competitive problems in the firm.

To test the predictions of the transfer theory directly, it is appropriate to restrict the study to the sample of LBOs, and to ask whether those LBOs predicted by the transfer theory to most likely effect transfers are indeed more likely to engage in DC follow-on terminations.

We estimate a regression for LBO firms only, including the additional variables affiliated with the transfer theory (column 6). The estimates employ the broader definition of post-LBO DC follow-on terminations (those occurring during the year of the LBO announcement or any year thereafter through 1988). We also estimate the model using the more restrictive definition of terminations to include only those occurring in the year of the LBO announcement or the year after (see column 5).

We include the ratio of projected post-LBO cash flow relative to required interest payments to test another variant of the implicit contract notion (as discussed above). This variable is not calculated for terminations that occur beyond one year of the LBO announcement, and thus is included only in column 5.

The results show that the cash flow variable is insignificantly different from zero. Other variables measuring variants of the same notion did no better (not reported): DC follow-ons do not appear to be explained by post-LBO cash flow constraints.[35]

[35] See footnote 31.

Other results in columns 5 and 6 are not encouraging to the transfer theory. The coefficients on the threatened takeover and management share variable are insignificantly different from zero: LBOs that effected DC follow-on terminations are not more likely to be either hostile or have disproportionately low management ownership shares, as the transfer theory suggests.

Finally, we consider the LBO premia as a way to test the transfer hypothesis. The theory predicts that the premia are attributable to expected transfers from workers and other stakeholders. In pension plans terminated by LBO firms during the year of the LBO announcement or the year after, and replaced by DC follow-on plans, excess assets amounted to 14.1% of equity (where equity is measured the year prior to the announcement) (see Table I). The LBO premia affiliated with these firms are 25.7% (see Table I). Thus, excess assets are sufficiently important to influence the premia, assuming the transfer hypothesis is correct. Put another way, we are clearly studying a large potential source of transfer in the context of the theory.

The results previously reported in Table II, however, do not reveal a statistically meaningful relation between LBO premia and either the attempt of a takeover or available pension excess assets in relation to equity value. These results are not consistent with the theory. Arguably, the results are biased against the transfer hypothesis because perhaps the market knows that it is not profitable to effect transfers from workers' pensions in all firms, that these transfers are optimal only in selected firms. To test this idea, we assume, as the transfer theory does, that the LBO premia reflect anticipated transfers, and thus, that the portion of the premia affiliated with a transfer from a pension is correlated with those LBO firms that subsequently effected the transfer through a DC follow-on transaction.

We thus reran the premia regression reported Table II, column 5, including three new dummy variables equal to unity alternatively if a pension termination is observed after the announcement and is either a reestablishment, a DC follow-on, or is followed by no new plan (plant closing or sell-off). The coefficient on the DC follow-on plan is insignificantly different from zero.[36] Thus, the predicted premia relations in the transfer theory are not borne out by the data.

VII. Summary of Results

There is a strong and statistically significant increase in pension terminations following LBO announcements. Compared to observations describing LBO firms in pre-announcement years, and those affiliated with control firms, the termination rate more than doubles in LBO firms during the year of the LBO announcement and the subsequent year.

Many LBO-related terminations are difficult to explain using a transfer

[36] The coefficients (t-statistics) on the three dummy variables were .062 (1.14) REESTABLISHMENT, −.057 (1.03) DC FOLLOW-ON, and .13 (1.69) NO PLAN. The remaining variables were not affected in an important way compared to the results reported in Table II (column 6).

theory of LBOs. Specifically, approximately 40% either are affiliated with plant closings around LBO announcement dates, or are transactions designed to borrow assets from the pension trust fund, with minimal consequences for workers (reestablishments). The predominant LBO-related termination, however, is a straightforward termination of a defined benefit plan replaced with a defined contribution plan (DC follow-ons). These transactions impose large capital losses on workers.

The implicit contract theory envisions terminations of contracts under conditions that threaten the firm's competitive viability. We could not, however, explain the LBO impact on these transactions by appealing to either deteriorating financial conditions in these firms, or unusual cash flow constraints following the LBO. The theory had more success if generalized to include competitive conditions in the market.

That is, many DC follow-on terminations are found in firms employing unionized workers, or in firms using defined benefit plans when similarly situated firms did not, conditions that could portend competitive difficulties for the firm in the longer run. While these variables are indeed related to DC follow-on terminations, they do not displace a large measured LBO effect on DC follow-on terminations.

In short, the implicit contract theory plausibly explains a substantial number of DC follow-on terminations, but not enough to undermine the transfer theory. Direct tests of the transfer theory, however, yield mixed results. Some evidence is consistent with the hypothesis that takeover threats are correlated with the availability of excess assets. A large number of LBOs were preceded by takeover threats. Takeover threats are positively related to the existence of excess pension assets. And excess assets available in cases of DC follow-on terminations are sufficiently large in relation to equity to explain a large portion of the LBO premia (about 50%).

The predictions of the transfer theory on the specific kinds of LBOs that should effect transfers, however, find little support in the data. The transfer hypothesis expects DC follow-on terminations to occur disproportionately in hostile LBOs (those that experienced a threatened takeover attempt), or LBOs whose management owned a small share of the firms stock prior to the event. The theory also expects that LBO premia are highest in firms that subsequently effect DC follow-on pension terminations. The empirical results are inconsistent with these predictions.

Part of the problem in making these tests is the lack of formal development of the efficiency explanation of LBOs and the implicit pension contract theory. With some notable exceptions (for example, Jensen (1986), Kaplan (1989)), the sources of new value in LBOs are usually left vague. If part of the gain is attributable to the termination of implicit contracts, we need to know more about the conditions that might warrant these terminations within the constraints of implicit contracts. A more fully developed theory would make it easier to distinguish a legitimate termination of a contract from one that effected a pure transfer. As it stands now, the transfer theory cannot find overwhelming support in the data. At the same time, the

efficiency theory does not obviously dominate the transfer theory as an explanation for LBOs, and the premia that accompany them.

REFERENCES

Allen, S., R. Clark, and A. McDermed, 1989, Pensions, bonding and lifetime jobs, Unpublished manuscript, N. C. State University.

Alderson, Michael and K. C. Chen, 1986, Excess asset reversions and shareholder wealth, *Journal of Finance* 41, 225-241.

Alderson, Michael and Jack VanDerhei, 1990, Regulating the recapture of surplus pension assets: Evidence and implications, Unpublished manuscript, Texas A&M University.

Ashraf, J., 1990, Recent trends in union wage premia, *Journal of Labor Research* 11, 435-452.

Beller, Dan and John Turner, eds., 1990, *Trends in Pensions* (G.P.O., Washington, D.C.).

Cornwell, Christopher, Stuart Dorsey, and Nasser Mehrzad, Opportunistic behavior by firms in implicit pension contracts, *Journal of Human Resources,* Forthcoming

Curme, M., B. Hirsch, and D. MacPherson, 1990, Union membership and contract coverage in the U.S., 1983-1988, *Industrial and Labor Relations Review* 44, 5-33.

DeAngelo, Harry, L. DeAngelo, and E. Rice, 1984, Going private: Minority freezeouts and stockholder wealth, *Journal of Law and Economics* 27, 367-402.

Gustman, Alan and Thomas Steinmeier, 1986, Pensions, unions and implicit contracts, NBER Working paper, No. 2306.

———, The Stampede Towards Defined Contribution Plans, *Industrial Relations,* Forthcoming.

Hay Huggins Company, 1986, *Pension Plan Terminations with Asset Reversions,* Final Report submitted to the U.S. Department of Labor.

Harrington, Scott and Jack VanDerhei, 1987, Internal vs. external financing in credit markets with asymmetric information: The case of pension plan asset reversions, Unpublished manuscript.

Ippolito, Pauline, 1990, Bonding and non-bonding signals of product quality, *Journal of Business* 63, 41-60.

Ippolito, Richard A., 1986, *Pensions, Economics and Public Policy* (Dow Jones-Irwin, Homewood, IL).

———, 1990, *An Economic Appraisal of Pension Tax Policy in the U.S.* (Richard D. Irwin, Homewood, IL).

———, 1985, The economic function of underfunded pension plans, *The Journal of Law and Economics* 28, 611-52.

———, 1991, An economic model of indenture, Unpublished manuscript.

Jensen, Michael C., 1986, Agency costs of free cash flow, corporate finance and takeovers, *American Economic Review* 76, 323-329.

Kaplan, Steven, 1989, Management buyouts: Evidence on taxes as a source of value, *Journal of Finance* 44, 611-632.

Lehn, Kenneth and Annette Poulsen, 1989, Free cash flow and stockholder gains in going private transactions, *Journal of Finance* 44, 771-788.

———, 1988, Leveraged buyouts: Wealth created or wealth redistributed? in M. Wiedenbaum and K. Chilton, eds.: *Public Policy Towards Corporate Takeovers* (Transaction Inc.).

Mitchell, Mark and J. Harold Mulherin, 1989, The stock price response to pension terminations and the relation of terminations with corporate takeovers, *Financial Management* 18, 41-56.

Mittelstaedt, H. Fred, 1989, An empirical analysis of the factors underlying the decision to remove excess assets from overfunded pension plans, *Journal of Accounting and Economics* 11, 399-418.

———, 1990, Takeovers, asset reversions, and wealth transfers, Unpublished manuscript, Arizona State University.

——— and Philip Regier, 1990, Further evidence on excess asset reversions and shareholder wealth, *Journal of Risk and Insurance* 62, 471-486.

Pesando, James, 1985, The usefullness of the wind-up measure of pension liabilities: A labor market perspective, *Journal of Finance* 40, 927-940.

Petersen, Mitchell A., 1989, Pension terminations and worker-shareholder wealth transfers, Unpublished manuscript, M.I.T.

———, 1990, Financial aspects of a firm pension choice: DB or not DB?" Unpublished manuscript, M.I.T.

Pontiff, J., A. Shleifer, and M. S. Weisbach, 1990, Reversions of excess pension assets after takeovers, *Rand Journal of Economics* 21, 600-613.

Sharpe, William F., 1976, Corporate pension fund policy, *Journal of Financial Economics* 3, 183-193.

Shleifer, Andrei and Lawrence Summers, 1988, Breach of trust in hostile takeovers, in A. Auerbach, ed.: *Corporate Takeovers: Causes and Consequences* (University of Chicago Press).

Stone, Mary, 1987, A financing explanation for overfunded pension plan terminations, *Journal of Accounting Research* 25, 317-326.

Thomas, Jacob, 1989, Why do firms terminate overfunded pension plans? *Journal of Accounting and Economics* 11, 361-398.

Treynor, Jack L., 1977, The principles of corporate pension finance, *Journal of Finance* 32, 627-638.

VanDerhei, Jack, 1987, The effect of voluntary terminations of overfunded pension plans on shareholder wealth, *Journal of Risk and Insurance* 59, 131-156.

White, H., 1980, A heteroscedasticity-consistent covariance matrix estimator and a direct test for heteroscedasticity, *Econometrics* 48, 817-838.