REPLACING DEFINED BENEFIT PENSIONS: 
AN ANALYSIS OF THE TREND TOWARD 
DEFINED CONTRIBUTION AND CASH BALANCE PLANS 

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Abstract 
Starting with the introduction of the 401(k) plan in 1978, defined contribution pensions have become increasingly popular. Over the past two decades the growth of defined contribution plans has continued to be strong as increased administrative costs and workforce demographics have made defined benefit pensions seem less attractive to many employers. Nevertheless, previous research has revealed that a firm’s termination of a defined benefit plan in favor of a defined contribution plan occurs infrequently. This paper reevaluates this research over the most recent period possible – 1995 to 2001 – also taking cash balance plans into consideration. The results indicate that one in ten participants switched from defined benefit pension coverage during this period. A closer look at the particular plans that changed pension type shows which firm characteristics impact the likelihood of terminating a defined benefit plan in favor of either a defined contribution or cash balance pension. 

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INTRODUCTION

The significant growth of defined contribution pension plan coverage over the last twenty years has had a major effect on the pension system as a whole. In response to this trend, the future of defined benefit pensions is continually in question. Currently, many of these defined benefit plans are facing financial trouble. A September 2002 Credit Suisse First Boston study estimated a deficit of $216 billion for the defined benefit pension plans of the S&P 500 firms alone. The Pension Benefit Guarantee Corporation (PBGC), the federal agency that insures defined benefit plans, believes that the entire pension system is today underfunded in excess of $350 billion. More importantly, $85 billion of those deficits belong to companies with considerable financial difficulties. Already $11.2 billion in debt, $7.6 billion from the year 2003 alone, the PBGC is in no position to take on upwards of $85 billion in defined benefit pension relief (The Economist, Feb. 5, 2004).

Part of the problem for the PBGC is the fact that newly created plans tend to be of the defined contribution variety (Kruse 1995). The PBGC has found that this lack of growth in newly-created defined benefit pensions has effectively lowered their premium base. While much of the financial worries of the PBGC are due to regulations regarding the valuation of pension liabilities, this deficiency of relief funds may very well prove to be critical. Defined benefit pension plan reform is urgently needed in order to protect the retirement income for these millions of Americans. But, in the meantime, more and more employers and employees are turning toward defined contribution plans as the favored tool for retirement savings.
This point about the current level of underfunding of the defined benefit pension system helps to illustrate the key difference between defined benefit and defined contribution plans. A defined benefit plan, according to the *Fundamentals of Private Pensions*, is “one in which the benefits are established in advance by a formula, and employer contributions are treated as the variable factor” (McGill and Grubbs 1989, p.105). The key feature of this type of plan is that the burden falls on the employer to make those benefit payments to its retired plan participants. Thus, the employer is exposed to the risk of the stockmarket, the changes in workforce demographics, and the overall state of the economy.

While a defined benefit pension offers employees more security for their retirement income, these benefits are not 100-percent guaranteed. There are some employers that have defined benefit pensions so underfunded that plan termination seems to be a distinct possibility. In the event this happens, the PBGC will take over the plan but often will only be able to match a fraction of the original benefits promised by the employer. The federal government takes an interest in avoiding these plan terminations to protect workers’ retirement benefits, as well as the solvency of its own agency, the PBGC. One tool that the lawmakers manipulate to achieve this objective is the discount rate. Raising the discount rate lowers the value of existing pension liabilities and also decreases premiums paid to the PBGC. As a result, firms are less likely to default on their plans, since the required contributions to the PBGC are smaller. The challenge for the designers of defined benefit pension reform is to determine an appropriate discount rate for accurately measuring pension liabilities, while also limiting the likelihood of plan termination. The recent downturn of the economy and uncertainty regarding future
pension regulation certainly make defined benefit plans seem less appealing to today’s employers.

The alternative type of pension is defined contribution. By definition, this kind of plan “provides an individual account for each participant and bases … benefits solely upon the amount contributed to the participant’s account and any expense, investment return, and forfeitures allocated to such participant’s account” (McGill and Grubbs 1989, p. 112). For this type of plan, the burden of risk falls on the employee. Mitchell (1999) points out that the appeal of defined contribution plans has stemmed from several factors, including a desire to invest in the stockmarket, new employer personnel needs, and changes in workforce demographics. Today’s younger workforce tends to favor defined contribution plans. This is because during a worker’s early years with a firm, salary plus accrued benefits are less than the marginal product of labor. In the later years of that worker’s career, salary plus accrued benefits are greater than the marginal product of labor (Bulow 1982). This economic theory reveals that defined benefit plans reward those workers who have stayed with the firm for a longer period of time. The benefit formulas are often designed such that the payments in retirement are largely based on an average of the employee’s most recent annual salaries. Thus, those workers who stay with the firm for a greater number of years are rewarded by defined benefit plans with larger payments in retirement. Defined contribution plans, on the other hand, are not based on benefit formulas. As a result, this plan type does not necessarily favor younger or older workers.

While better suiting the current workforce, defined contribution plans also feature lower administrative costs than defined benefit plans, as well as provide tax incentives on
pension contributions. Employee Benefit Survey (EBS) data confirm that these factors matter for many employers by showing that there is a significant trend towards defined contribution plans, particularly among small firms. For this group, a defined benefit plan’s high administrative costs cause many firms to offer a defined contribution plan instead. In recent years, EBS data reveal that even larger firms are making this change. Nevertheless, in spite of the trend, defined benefit plans are still offered by 72 percent of the S&P 500 companies (Prescott and Sylvestre 2003). Defined contribution plans have increased in number and participant coverage, but defined benefit plans have tended to consolidate into even larger plans sponsored by firms with a greater number of employees.

The intent of this paper is to explore this transition from defined benefit to defined contribution plans. However, in order to fully cover the movement away from defined benefit pension coverage, cash balance plans must also be considered. The U.S. Department of Labor (DOL) describes a cash balance plan as a defined benefit plan that states the promised benefit in terms of an account balance. This description shows that a cash balance plan is a sort of hybrid between a defined benefit and a defined contribution plan. By strict classification, however, cash balance plans are considered to be a type of defined benefit pension. Yet, they are distinct enough from the traditional defined benefit plans and have increased in popularity to the extent that the IRS added an appropriate pension code to its Form 5500 to be used if the pension has cash balance features.1 The first cash balance plans were created by the Kwasha-Lipton actuarial consulting firm in 1986 as a way of avoiding the 10 percent reversion tax in place at the time. The excess assets in a defined benefit pension are subject to this tax when a sponsor terminates the

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1 This pension code (1C) was added to the 1999 Form 5500 and has been available on all Form 5500s since.
plan. However, by amending the traditional defined benefit plan to include cash balance features, the employer avoids having to pay this reversion tax while effectively changing the pension over to a disguised form of a defined contribution plan. In 1990, this reversion tax was increased to 50 percent, which made cash balance amendments even more appealing. So, even though cash balance plans are not technically classified as defined contribution by the DOL, they are necessary to consider in order to more accurately determine the extent of the movement away from the traditional defined benefit pensions.

The first part of this analysis deals with examining a given sample of plans to determine precisely how many terminations of defined benefit pensions there were in favor of either defined contribution or cash balance plans. This study builds on the work of Ippolito and Thompson (2000) who considered the substitution of defined contribution for defined benefit plans between 1987 and 1995. While Ippolito and Thompson acknowledged the importance of cash balance plans in their research, they did not fully consider them in their conclusions. The second part of this analysis involves taking a closer look at those plans that did terminate in favor of defined contribution or cash balance pensions. Industrial classification, unionization, sponsoring firm size, plan size, as well as other factors are analyzed to reveal which employers are more likely to switch away from their defined benefit plans. Again, Ippolito and Thompson did a similar analysis, so the results from this study offer a worthwhile comparison between these two time periods. The goal of this research is to extend the analysis of the trend away from defined benefit plans through the 1990s, such that the quantitative results from over the

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2 Ippolito and Thompson did search the hardcopies by hand and determined that 3.7 percent of the participants in their sample of 249 plans were covered by cash balance plans. Therefore, they concluded that their results on the trend away from defined benefit plans are understated.
past two decades, in addition to more general economic reasons, help formulate a prediction for the future of the defined benefit pension system.

LITERATURE REVIEW

DEFINED BENEFIT VERSUS DEFINED CONTRIBUTION

Before discussing the previous techniques used to analyze this trend toward defined contribution plans and the results of these studies, it is important to have a basic understanding of the underlying economic reasons commonly cited in the literature that contribute to an explanation of this transition. Gustman and Steinmeier (1992) claim that at least half of the movement away from defined benefit plans is due simply to shifts in employment. They noticed an increase in workers in smaller, nonunion firms in the service sector – featuring lower defined benefit plan coverage – and a corresponding decrease in large, unionized firms in the manufacturing sector – featuring higher defined benefit plan coverage (also noted by Ippolito 1995). This point is particularly interesting because it focuses on the employees as a significant cause of this change in pension coverage, since the employer obviously cannot readily alter its industrial classification, size, or unionization. As a consequence of the amount of this employment shift, Gustman and Steinmeier argue that no more than half of the trend is attributable to firms changing from defined benefit to defined contribution pensions. Kruse (1995) confirms this finding and takes it one step further. He believes that the decrease of plan participants in companies featuring defined benefit plans is the primary cause of declining defined benefit pension coverage. Again, the logical result of this argument is
that not much of the growth in defined contribution pension coverage is the result of firms terminating their defined benefit plans.

There are three main advantages of defined contribution plans over defined benefit plans that Kruse (1995) notes. First, defined contribution plans by design have lower administrative costs. The practical reason for this is that defined contribution plans simply do not have to expend the resources necessary to meet a defined benefit plan’s actuarial standard that ensures implicitly-promised pension benefits. Kruse believes that this factor explains only a fraction of the growth in defined contribution plans, but certainly may lead some firms to favor this type of pension. A related point is that the defined contribution plans are generally subject to less regulation than defined benefit plans. Clark and McDermed (1990) conclude that rather than shifts in employment, pension regulation is what is largely responsible for the declining defined benefit coverage that occurred between 1979 and 1983.3 In contrast to these results, Kruse’s estimates show that regulatory costs explain very little of the growth in defined contribution coverage over this period. Indeed, this point about administrative costs is often cited as a reason why large firms generally tend to have defined benefit plans and smaller firms typically offer defined contribution plans. However, more recent research reveals that these costs are not a significant cause of the trend toward defined contribution plans (Ippolito and Thompson 2000).

A second feature favoring defined contribution pensions that Kruse cites is plan flexibility. Under a defined contribution scheme, pension contributions can be based on employee performance rather than on a scheduled formula. Also, the risk associated with

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3 They estimate that changes in firm size and industrial composition account for only 3.1 of the 15 percentage point decline in defined benefit coverage over the period (1979-83).
the pension assets falls on the employee instead of the employer. This arrangement is certainly capable of benefiting both the employer as well as the employee. For example, consider the 401(k) plan – a specific type of defined contribution pension that came into regular use in 1981, following clarifying regulations made by the IRS. Employees are able to make voluntary contributions to their pension plans, and most employers offer a match equal to some percentage of those employee contributions. The Tax Reform Act of 1986 does cap the tax-free employee contribution amount at $7,000, indexed for inflation – the maximum allowable contribution to a 401(k) in 2004 is $13,000. However, even with this cap on contributions, employees still gain a vehicle for tax-deferred savings and also achieve an instant return on their investments when their employers match a percentage of their contributions. At the same time, the employers only need to contribute to the pension if they decide to offer a match, and then only when employees choose to make contributions. Such plan flexibility can certainly be attractive to both the sponsoring firm as well as the participants.

Third, Kruse points out that defined contribution plans can allow for more than 10 percent of pension assets to be invested in or loaned to the plan sponsor. In this way, firms choosing to offer defined contribution pensions have a potential source of capital that is less costly and would not be available if they had defined benefit plans. Other studies support this point by finding that financial factors do contribute heavily to a firm’s decision to terminate overfunded defined benefit plans (Peterson 1989 and Hamdallah and Ruland 1986). However, it is important to note that today there are few overfunded defined benefit plans. Thus, the main concern is not so much that pension assets are a potential source of capital for the firm, but rather that pension contributions
do not require a major percentage of the firm’s total available cash. The recent bear
financial markets have caused net pension income to turn into net pension expense. This
has put a significant strain on defined benefit plans, since equity investments comprise
approximately two-thirds of all pension assets (Prescott and Sylvestre 2003). Even
though the economy is now improving, large defined benefit deficits still remain and
many companies are not yet in a strong enough position financially to correct the level of
underfunding and increase their pension contributions by the amounts needed.

Considering the advantages of defined contribution plans over defined benefit
plans raises the question of which types of firms are more likely to choose a defined
contribution pension scheme. Kruse (1995) found that industries with lower proportions
of blue-collar workers, higher levels of capital intensity, and smaller company sizes
tended to select defined contribution plans. These firms are, in general, not unionized,
since unions have traditionally favored defined benefit pensions. Ippolito and Thompson
(2000) tested a similar selection of sponsoring firm characteristics over the period from
1987 to 1995. Specifically, they considered the size of the plan, the size of the
sponsoring firm (total employees), relative maturity\(^4\), unionization, and industrial
classification. Ippolito and Thompson found that while most of these variables are not
statistically significant, industrial classification stands out as being a relatively important
factor. Those firms in the health services sector or in public administration were more
likely to terminate in favor of a defined contribution plan than those firms in the
transportation, trade, and manufacturing industries. Ippolito and Thompson point out that
this confirms findings that defined contribution plans have increased in popularity in the

\(^4\) Ippolito and Thompson define relative maturity as the percent of participants that are either retired or
separated compared with the mean value of this number over their 249 plan sample.
service sector, which has historically exhibited a lower percentage of defined benefit coverage. Reexamining the above findings, the study in this paper looks at whether the other variables in this model have become statistically significant and if industrial classification continues to be an important factor for the period between 1995 and 2001.

A LOOK AT PENSION SUBSTITUTION IN THE 1980s AND EARLY 1990s

However, before analyzing defined benefit replacement from 1995 to 2001, it is critical to know what prior studies have revealed about this trend over the previous 15 years. Gustman and Steinmeier (1992) looked at the period between 1977 and 1985. They searched the IRS Form 5500 filings, excluding public pensions, plans with missing data, and firms with less than 100 employees. There were three issues with the dataset that the authors noted. First, the Form 5500 data fail to indicate which the primary plan is for those individuals covered by multiple types of plans. Gustman and Steinmeier mitigated this problem by grouping plans by employer identification number (EIN), and then labeling the plan primary if it was the only one offered. If this was not the case, the plans within each EIN were then grouped geographically, and the plan with defined benefit elements was labeled the primary plan, or else the largest defined contribution plan was made primary. The second problem they found was that the Form 5500 data for their sample years did not show information on collective bargaining status. The authors dealt with this by utilizing the 1977 EBS data to find the union status for each EIN and plan number (PN).

Most important, though, was the third problem with the dataset. Gustman and Steinmeier explicitly state that they do not track individual firms or plans over time. Their reason for not doing this is that EINs tend to change frequently, which makes it
very difficult and tedious to carry out this procedure for a large sample. Instead, the authors consider the data from only three specific years – 1977, 1981, and 1985 – to evaluate the general trend over this period. Gustman and Steinmeier observed that between 1977 and 1981, defined benefit pension coverage declined very slightly from 89.8 percent to 88.1 percent of employees. However, by 1985, this number was down to 79.5 percent, so that the decline over the entire period of study was roughly ten percentage points. Nevertheless, the authors believe that these results do not signify that firms employing one out of ten workers made the switch to defined contribution plans. Using constant weights over the period by union status, firm size, and industrial classification, they found that the decline in defined benefit coverage was then only half as large. Therefore, as previously stated, Gustman and Steinmeier attribute no more than half of the change to firms switching plans, but attribute at least half of the trend to observed employment shifts from defined-benefit-type firms to defined-contribution-type firms. With respect to regulatory costs, they found that the effect was minimal but might become an issue to consider for a later period given the passage of the Omnibus Budget Reconciliation Act (OBRA) of 1987.

The analysis done by Gustman and Steinmeier (1992) was extended by Kruse (1995), who considered pension substitution over the period from 1980 to 1986. Kruse also utilized the Form 5500 data, selecting all companies with more than 100 employees and a 10 percent sample of companies with plans covering less than 100 employees. The main focus of Kruse’s study was to find out how much of the growth in defined contribution pension coverage was due to newly created plans and how much was due to the replacements of defined benefit plans. Basic data observations showed that, over the
period, 233,400 companies adopted defined contribution plans while only 89,100 adopted
defined benefit plans. Terminations totaled 67,400 for defined contribution plans and
47,600 for defined benefit plans. Concerning participation, terminated defined benefit
plans caused a loss of 1.4 million participants while the continuing defined benefit plans
lost an even greater 1.7 million participants. Defined contribution plan participation, on
the other hand, increased dramatically from 19.3 to 33.0 million. New defined
contribution plans accounted for 10 million of these participants, while 4.7 million joined
firms maintaining their defined contribution plans. In reviewing these numbers, it is easy
to see why Kruse concluded that the growth of defined contribution plan coverage was
primarily due to newly introduced defined contribution plans.

This result provided an answer for the first part of Kruse’s question, but then there
was the issue of how much of the growth was the result of defined benefit plan
terminations. Kruse found that a mere 4 percent of the growth in defined contribution
participants came from terminated defined benefit plans. Also, over this period, Kruse
noted that the growth of defined benefit participants from newly introduced plans was 2.8
million, which more than offset the 1.4 million participant decline due to plan
terminations. Furthermore, he observed that the largest declines in defined benefit
participation came from the continuing defined benefit plans. These numbers support his
conclusion that defined benefit plan terminations were not a significant source of growth
for defined contribution pension coverage.

Ippolito and Thompson (2000), however, are critical of Kruse’s methodology. They believe that, given the noise in EINs and PNs in the Form 5500 datasets, Kruse’s
use of the data is subject to error. For instance, mergers, acquisitions, or spinoffs often
cause these identification numbers to change. Since the sample Kruse used was so large, it was not possible for him to carefully track all of these changes. Thus, what may appear to be a termination of two defined benefit plans and the creation of a new, larger defined benefit plan may in actuality be a merger between two plans. It would be wrong for Kruse to count two terminations while recording a newly created defined benefit plan. Hence, the amount of activity that Kruse observed is likely to be overstated.

Nevertheless, it is intriguing that his conclusions about the lack of defined benefit plan replacement are in fact supported by subsequent studies, including that of his critics Ippolito and Thompson (2000).

Papke (1998), in looking at the period between 1985 and 1992, reached a different conclusion regarding the amount of substitution between defined benefit and defined contribution plans. She used the Form 5500 data to construct a panel of firms sponsoring defined benefit plans in 1985. Papke then compared pension choice for those same firms in 1992, accounting for any changes in 401(k) or other defined contribution plan offerings. Over this period, Papke observed that the number of defined benefit plans fell from 167,111 in 1985 to 86,797 in 1992. She also stressed that 401(k) plans in particular exhibited significant growth over this period – 29,869 plans in 1985 compared to 139,704 plans in 1992. These numbers led Papke to investigate how a change in 401(k) or other defined contribution pension status affected the likelihood of an accompanying defined benefit plan termination. The results of her model showed that when a new 401(k) plan was offered, the probability that the firm will terminate its defined benefit pension more than doubled from 0.17 to 0.353. The addition of a different type of defined contribution plan increased the termination probability by 0.24, and maintaining an existing defined
contribution plan increased this probability by 0.186. Papke’s final conclusion was that over 20 percent of firms terminated their defined benefit plans between 1985 and 1992 in favor of some type of defined contribution plan. This result suggests that these terminations of defined benefit plans are indeed contributing significantly to defined contribution pension growth. This contradicts the conclusion that Kruse reached for the previous period between the years of 1980 and 1986.

While Papke seemed to have observed acceleration in the replacement of defined benefit with defined contribution plans in the period following Kruse’s study, there are problems with her methodology that directly impact the quality of the results. Papke attempted to track 16,597 defined benefit plans from 11,950 different sponsors over this time period. However, like Kruse, Papke failed to account for the problems that arise when matching this quantity of EINs and PNs over a given time period. The temptation is to consider the entire number of plans available in the data in an effort to obtain the most statistically accurate results possible. Unfortunately, the reality is that, if each identification number is not tracked meticulously, the changes that occur in these numbers can lead to the incorrect matching of plans and erroneous results. Consider the situation in which two defined benefit plans merge together into one larger defined benefit plan. However, say the identification numbers associated with one of those merged defined benefit plans are later assigned to a newly created defined contribution plan. Papke would record a defined benefit plan termination in favor of a defined contribution plan when she should have only noted one newly created defined contribution plan. This example is not an uncommon occurrence in the Form 5500 data,
and undoubtedly affects the quality of the conclusions Papke reaches about the extent of defined contribution substitution in the event of defined benefit plan termination.

CONCLUSION

Ippolito and Thompson (2000) utilized the best method of all these studies to answer the question of how significant defined benefit plan replacement has been. They considered the period from 1987 to 1995, and elected to track only a small sample of defined benefit plans using the Form 5500 data. By keeping the sample size to 249 plans, Ippolito and Thompson were able to have a sample large enough to generate statistically significant results, but also a small enough sample so that they could carefully track each plan over the entire period to ensure that the correct status was determined. They found that, on a participant-weighted basis, 95.6 percent of the 1987 defined benefit plan sample still offered defined benefit pension coverage in 1995. This conclusion is strikingly similar to that of Kruse (1995), despite the critical difference in methodology. Ippolito and Thompson do point out three shortcomings of their study. First, the results cannot necessarily be extended to those plans with fewer than 500 participants. Second, the increased use of cash balance plans needs to be fully considered when discussing changes from defined benefit to defined contribution pensions. Third, the presence of secondary plans may indicate a decreasing emphasis of defined benefit pensions within sponsoring firms. Nonetheless, Ippolito and Thompson contributed a very useful model for analyzing pension substitution.

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5. Ippolito and Thompson randomly selected 203 firms sponsoring at least one defined benefit plan with a minimum of 500 participants, which yielded a total sample of 249 plans.
This paper continues to analyze the trend away from defined benefit plans for the most recent period, 1995 to 2001, by adapting the methodology used by Ippolito and Thompson. Taking both defined contribution and cash balance plans into account, the results present a more complete look at the trend. The Form 5500 data now indicate whether or not a plan is cash balance, which makes this part of the analysis more efficient than the hand-checking of the Form 5500 hardcopies done by Ippolito and Thompson. The results show whether the patterns of plan substitution from 1995 to 2001 are in agreement with the findings of Kruse (1995) and those of Ippolito and Thompson (2000).

**METHODOLOGY**

**THE IRS FORM 5500 DATA**

The primary data used for this study were the IRS Form 5500 filings from the plan years 1995 through 2001. The Form 5500 is required to be filed under sections 104 and 4065 of the Employee Retirement Income Security Act of 1974 (ERISA) and sections 6039D, 6047(e), 6057(b), and 6058(a) of the Internal Revenue Code.\(^6\) Initially, the 2002 plan year was to be included in the study period, but it turned out that the Form 5500s from this year were still not complete enough at the time of this study to use for the analysis. Sponsoring firms are given 210 days after the end of their plan year (which does not have to be the end of the calendar year) to file the necessary Form 5500(s) with the DOL. Throughout the following year, the DOL records and processes this data before it is made public. As a result of this lengthy process, the most recent data is not always readily available.

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\(^6\) Only plans with 100 or more participants are required to file a Form 5500.
It should be noted that the layout of the Form 5500 was significantly altered in the 1999 plan year, and these changes have remained for all subsequent plan years. From 1995 through 1998, the basic Form 5500 provided much of the information necessary to track the status of each pension plan. Of course the plan name and identification numbers were given. But, there were also questions regarding assets transfers and plan terminations. For the purposes of this study, the various Schedules and other attached documents offered very little useful information for tracking the pensions. On the other hand, the basic Form 5500 from the plan years 1999 through 2001 provided not that much information at all. In fact, it was reduced from six to three pages, and essentially presented only the general plan information and the number of plan participants. However, the information that was available on the previous basic Form 5500 is now provided on the attached Schedule H for the new Form 5500. This attachment includes four separate sections: (1) Asset and Liability Statement, (2) Income and Expense Statement, (3) Accountant’s Opinion, and (4) Transactions During Plan Year. As these section titles indicate, the questions contained on the Schedule H are virtually the same as those included on the basic Form 5500 from the previous years. Thus, using the Schedule H in conjunction with the basic Form 5500 for plan years 1999 through 2001 makes it possible to track plans in the same way as before. Even though the format of the required filings was altered during this period, the information used for this study was consistently available somewhere within the Form 5500 data.
SAMPLE CONTRUCTION

The first step was narrowing down the data to only the appropriate types of plans. There were 62,104 total plans of all types in the 1995 Form 5500 database, 41,021 of which were single-employer plans. Ippolito and Thompson (2000) point out that there are relatively few multi-employer plans, and that these have tended to remain defined benefit due to the fact that they typically cover unionized workers. Thus, for the purposes of this study, only single-employer plans will be considered. Of the 62,104 total plans, there were 17,267 defined benefit plans in the database, 11,290 of which were single-employer plans. Ippolito and Thompson chose to limit their selection to only those plans with 500 or more participants. This accounted for approximately 90 percent of participants for all single-employer defined benefit plans in 1987. For the 1995 sample, however, the plans with 500 or more participants accounted for only 88 percent of all participants. Rather than limit the sample in this way, this study considered all those plans with 250 or more participants, increasing the plan coverage to roughly 95 percent of all participants. Taking plan size into consideration, the 11,290 plans were reduced to 6,630 single-employer defined benefit plans with 250 or more participants. Since one firm sometimes sponsors multiple defined benefit plans, this sample actually represents only 5,162 different plan sponsors.

The second step was to randomly select a sample of 200 firms from this list of 5,162 unique EINs. Including more than 200 firms in the sample size makes it both difficult and increasingly impractical to properly track each of the corresponding plans.

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7 This paper dealt only with private pension plans. This is primarily because public pensions are predominantly defined benefit and offer little evidence to explain the trend toward defined contribution and cash balance plans.
8 This study used a random selection procedure within The SAS System, v. 8.2, to choose the group of 200 firms. Ippolito and Thompson simply selected every twenty-seventh firm from an ordered list of EINs.
throughout the time period. The 200-firm sample size is not too small either – a sample of around 250 plans is highly characteristic of the entire group of single-employer defined benefit pensions (Ippolito and Thompson 2000). The 200 firms that were randomly selected from this list yielded a sample of 254 defined benefit plans with more than 250 participants that were used for this study.

MATCHING THE PLANS

The goal of the first part of this analysis was to determine the percentage of defined benefit plans that are switching to defined contribution pensions and the percentage of plans that are switching to cash balance pensions. In order to do so, it was necessary to find out how many plans from the sample of 254 made these respective switches between 1995 and 2001. This process involved matching the plans across the period to reveal any changes in plan status. The first technique employed was to simply match the 1995 EIN and PN with the 2001 EIN and PN for each plan. Because these identification numbers can change over time, the plan name and the date the plan was created were used to verify that the identification numbers were indeed correct. By executing this technique, 132 of the sample plans were found to still be defined benefit in 2001. This is approximately 52 percent of the plan sample that did not change pension type. Interestingly, for these 132 plans, participation grew from 403,122 in 1995 to 446,237 in 2001. This information supports the commonly observed fact that defined benefit plans have tended to consolidate into plans of larger size. This initial matching process also identified 9 cash balance plans in the 2001 Form 5500 data. This represents approximately 3.5 percent of the total sample of plans.
If both the defined benefit and cash balance plans are included, this technique matched approximately 55 percent of the sample. Utilizing this same method, Ippolito and Thompson (2000) were able to recover 135 plans of their 249 plan sample, giving them an initial survival rate of 54 percent. This figure is extremely close to the preliminary result found in this study. While this rate from 1995 to 2001 appears to be virtually the same as that from 1987 to 1995, this first step accounts for just over half of the plans in the sample. The similarity between these two rates could very well be the result of the limited ability to match plans by identification numbers across years. After all, this technique was only able to correctly match roughly 55 percent of the plans in the sample. Given the fact that Kruse (1995) and Papke (1998) employed this matching method as their primary technique for tracking plans, their findings seem to be subject to error.

Asset Transfers

In order to determine the plan type in 2001 for the remaining 113 sample plans, the Form 5500 data had to be more rigorously inspected. A common occurrence is for plan assets to be transferred to other pensions. Those plans that receive these assets almost always have a different EIN or PN, which is why matching by identification numbers fails to work. Sponsoring firms are required to report information regarding the transfer of pension assets on the basic Form 5500 for plan years 1995 through 1998 and on the Schedule H for plan years 1999 and later. Specifically, the plan sponsor is asked if during the year the plan merged or consolidated into another plan(s), and if any asset transfers occurred. The plan name, EIN, and PN are provided for those plans receiving
the asset transfers. This occurrence is counted as a plan termination in favor of the type of plan that is receiving the asset transfer. To confirm that the original plan was completely closed out required comparing the amount of the reported transfers from the original plan to the calculated net assets for that plan at the end of the year. Searching for these assets transfers involved recording all of the reported transfers over the period for those 113 plans. Using the new plan names, EINs, and PNs, it was possible to match up 24 additional pensions. There were 19 defined benefit plans recovered and 5 transfers to cash balance plans, bringing the totals of matched plans to 151 and 14 respectively.\(^9\)

*Changed Identification Numbers and Company Names*

There needed to be a third technique applied to uncover the 2001 plan type for the 89 remaining unmatched plans. Within the Form 5500 data, there is a tendency for a sponsoring firm’s EIN to change or for the plan numbers to be different across the time period. Mergers, acquisitions, or spinoffs are often the cause of such changes. However, there are even some instances in the data where these identification numbers are different for no particular reason whatsoever. These plans are not able to be tracked by solely looking at the identification numbers. The key to recovering these pensions is to search the Form 5500 data by the name of the sponsoring firm, as opposed to searching by EIN or plan name. Doing so makes it clear when the EIN for a given sponsoring firm has been changed. It may also be the case that the company name for a given plan is different across the period. When the company name is changed, the identification numbers also tend to be different. The only way to track these plans is to look at the

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\(^9\) For those instances when assets were transferred to multiple plans, the plan receiving the greatest amount of assets from the original defined benefit plan was matched to determine plan type in 2001. It should be noted that these multiple transfers were rare in this sample data.
Form 5500 data from year to year. First, a search is done by company name. If this does not work, then another search of the data is performed by plan name. This technique was effective in recovering 33 of these remaining plans. There were 26 pensions determined to continue to offer defined benefit coverage, while 3 switched to defined contribution, and 4 became cash balance plans.

*Further Checking the Data by Hand*

At this point, there were still 56 unmatched plans from the 254 plan sample. The only matching technique left was to take each individual plan and track it carefully by hand until it seemingly disappeared from the Form 5500 data. By going back to the previous year, it was almost always possible to determine what had happened to the plan. In many instances, there was an asset transfer to another plan that did not show up on the Form 5500 from the previous year. These were discovered in the following way. First, the last known number of participants and net assets were recorded for the lost pension plan. Then these numbers were compared with the data from the firm’s other pension plans in the subsequent year. Any abnormal increases in net assets or plan participation in these other plans were sometimes found to be equivalent to the respective amounts of the lost plan. In these cases, the plan that had disappeared was actually absorbed into one of the firm’s other pensions without the transaction being recorded on any Form 5500 filing.

For some unmatched plans it was necessary to find out what happened to the company itself in order to determine where the company’s pensions went. This was done by reviewing the business history for the various companies available on Hoover’s
Online. These summaries note mergers, acquisitions, and spinoffs, and also provide any other names under which the company has recently operated. Using this information, the next step was to return back to the Form 5500 data to see whether this plan was directly transferred to a different company or was absorbed into one of the existing pension plans of that company. As a final check, the section on retirement benefits in each firm’s annual report was reviewed to confirm any of the changes in the nature of pension coverage for the firm’s plans.

Through this extensive method of hand-checking, the status of all the remaining unmatched plans was determined. There were 22 additional plans that remained defined benefit over the period, 15 that switched to defined contribution plans, and 3 that became cash balance plans. There were 16 plan terminations that occurred between 1995 and 2001. Some of these terminations were confirmed by the PBGC’s List of Trusteed Plans. Others were indicated on the respective plans’ Form 5500 filings. For these terminations a rigorous inspection of the Form 5500s for the firms’ other pension plans was performed to verify that there were no follow-on plans.

All of the pensions from the 254 plan sample were successfully tracked, but the process required absolutely exhaustive searches of numerous data sources in order to follow certain plans in the sample. It should now be clear why many researchers choose to match up EINs directly across a given time period rather than attempt to individually track all the plans they want to consider for their studies. The process of closely investigating all 11,290 single-employer defined benefit plans in the 1995 Form 5500 database would be an overwhelming and extremely time-consuming project. Those studies that match EINs gain statistical credibility for their results due to the use of a
larger sample size. But, these results are undermined by the errors that occur with using this sort of methodology. Generally, this is the problem with doing research based on the Form 5500 data. Nevertheless, the sample size of 254 plans used for this study was manageable to track, and the observed characteristics of this group were indeed reflective of the larger sample of plans. Thus, as Ippolito and Thompson (2000) also demonstrated, this method is the most effective way to accurately determine the survival rate of defined benefit plans.

RESULTS

At the end of the 2001 plan year, 199 of the 254 sample plans from 1995 still provided defined benefit pension coverage. This is a survival rate of about 78 percent. Ippolito and Thompson (2000) figured this same rate to be just over 85 percent for their sample. Excluding cash balance plans, their rate drops to roughly 82 percent. Thus, the period between 1995 and 2001 exhibited a lower survival rate for defined benefit pensions by approximately four percentage points than the preceding period between 1987 and 1995. Weighting these plans by participant size (based on the 1995 plan counts\(^{10}\)), this study found that 87.7 percent of the 1995 plan sample continued to offer defined benefit pension coverage in 2001. Ippolito and Thompson found that, on a participant-weighted basis, this rate was 95.6 percent for the period of their study. Excluding cash balance plans, their rate falls to 91.8 percent. So, on a participant-weighted basis, the survival rate also declined by close to four percentage points. These

\(^{10}\) The 2001 plan counts cannot be used because plans have combined with other plans, essentially adding participants who were not in the original 254 plan sample.
results indicate that there has been a moderate drop in defined benefit survival for the period between 1995 and 2001.

There were 18 of the 254 sample plans that terminated in favor of defined contribution pensions during the period. Interestingly, this is the same raw number of switches to defined contribution plans that was observed by Ippolito and Thompson between 1987 and 1995. For the study in this paper, these 18 plans represent just over 7 percent of the entire sample of plans (only 3 percent on a participant-weighted basis). Such a small percentage supports previous findings that the surging growth of defined contribution pension coverage is not being caused by defined benefit plan terminations. Rather, such terminations continue to be rare events.

In fact, the count of defined contribution plans from this study may actually be somewhat overstated. When there was a defined benefit plan termination that did not state asset transfers to a follow-on plan, the firm’s other pensions were studied to determine if one of these previously secondary plans could have inherited the assets and participants from the terminated plan. Assume that these assets were transferred to a 401(k) plan – now the firm’s primary plan. However, it is not necessarily the case that the participation rate in the 401(k) plan immediately becomes 100 percent for those individuals that were covered by the terminated plan. Therefore, it can be difficult to tell whether a 401(k) plan is growing due to a terminated defined benefit plan or whether it is merely exhibiting normal growth that would have occurred otherwise in spite of this termination. There were several instances of this particular situation in the plan sample for this study. Ippolito and Thompson point out that these defined contribution successor plans often do have a participation rate that is less than 100 percent. They reason that
these plans should count as switches to defined contribution, since that is the primary
pension offering by the sponsoring firm. For the sake of generating comparative results
to the work done by Ippolito and Thompson, this study was consistent with their
methodology. Even if the results are overstated in reality that would only strengthen the
argument that defined benefit plans are not frequently converted to defined contribution
plans.

The single most significant result of this part of the study was finding a total of 21
cash balance plans at the end of the period.11 Ippolito and Thompson had only noted 13
of their 249 plans that had become cash balance between 1987 and 1995, accounting for
3.7 percent of their sample participants. On the other hand, this study found that 8.3
percent of plans from the 254 plan sample converted to cash balance. Based on the 1995
counts, this is approximately 7.4 percent of the sample participants – double the
percentage found by Ippolito and Thompson for the previous period. Amending the
traditional defined benefit pensions to cash balance plans has increased significantly for
the period between 1995 and 2001. Intuitively, this finding is understandable. Bull
financial markets in the late 1990s caused the value of pension assets to increase
considerably. The principle design benefit of the cash balance plan is the ability to avoid
the reversion tax applied to excess pension assets when a defined benefit plan is
terminated. Thus, the plan conversions from overfunded defined benefit plans during this
period would logically exhibit a greater frequency of cash balance switches. Firms would
be required to pay a higher amount for the reversion tax than during the preceding period
when pension assets were not as valuable. If the observations from this study are at all

11 It may have been the case that a plan already had cash balance features in 1995, since the Form 5500 data
did not have the appropriate pension code. However, all of the 21 plans counted did switch at some time
from a traditional defined benefit plan.
relevant, then it should be the case that the bear financial markets that prevailed in 2001 and 2002 would actually lower the instance of defined benefit terminations in favor of cash balance plans. Further research needs to be done to fully evaluate this observed relationship between the level of funding of a defined benefit plan and the frequency of cash balance amendments.

Figure 1: Plan type in 2001 for the 1995 sample of 254 plans

Figure 2: Participant-Weighted Basis, Type of Pension Coverage for Sample Plans in 2001

(based on 1995 participant counts)
The basic results of this study are summarized graphically in Figures 1 and 2. Figures 3 and 4 present, in the same format, the results from Ippolito and Thompson (2000) that were cited above when comparing the numbers from the two time periods.

**Results from Ippolito and Thompson (2000)**

**Figure 3: Plan Type in 1995 for the 1987 sample of 249 plans**

- Defined Benefit, 204
- Defined Contribution, 18
- Cash Balance, 13
- Terminated, 14

(based on 1987 participant counts)

**Figure 4: Participant-Weighted Basis, Type of Pension Coverage for Sample Plans in 1995**

- Defined Benefit, 91%
- Defined Contribution, 3%
- Cash Balance, 4%
- Terminated, 2%

(based on 1987 participant counts)
There were 39 terminations of defined benefit plans in favor of either defined contribution or cash balance plans over the study period between 1995 and 2001. This represents over 15 percent of the 254-plan sample, which equates to just over 10 percent on a participant-weighted basis. The participant-weighted percentage is a third less, indicating that smaller firms are more likely to make the change away from defined benefit pensions. This result offers some empirical support for similar findings in previous research regarding plans of smaller sizes (EBS data). This explains precisely why the percentage of plans that switched is not equivalent to the percentage of employees that changed pension coverage. It should also be noted that there were 16 plan terminations without any evidence of follow-on plans that occurred during the study period. These terminations account for about 6 percent of the sample of plans, or approximately 2 percent on a participant-weighted basis.

Taking both defined contribution and cash balance plans into account, these results imply that roughly one in ten participants covered by a defined benefit plan in 1995 had their pension coverage changed by 2001. For the years 1980 through 1986, 4 percent of defined benefit plan participants changed to defined contribution coverage (Kruse 1995). Between 1987 and 1995, 6 percent of participants were converted from a defined benefit to a different type of pension plan (Ippolito and Thompson 2000). The study done in this paper shows that this percentage of participants changing pension types has nearly doubled over the six years following the period analyzed by Ippolito and Thompson. This is certainly a significant acceleration in the overall trend. Indeed, it was the increase in cash balance conversions that became a key difference between the two studies. The next part of this paper deals exclusively with those 39 plans – 18 defined
contribution and 21 cash balance – that took the place of defined benefit pensions in the original plan sample. The goal of this secondary analysis is to investigate what sponsoring firm characteristics affect the likelihood of a defined benefit plan terminating in favor of an alternative type of pension.

MODEL

This model is designed to measure the factors influencing the probability of defined benefit terminations in favor of defined contribution and cash balance plans. The design was directly adopted from the analysis performed by Ippolito and Thompson (2000). Due to a different restriction on plan size (500 plus plan participants for the study done by Ippolito and Thompson versus 250 plus participants for this study), certain variables in the model had to be adjusted accordingly. Also, the various industrial classifications were made slightly differently. Nevertheless, this model yields essentially the same type of results. Using a similar form for the regressions provides a set of coefficients that can be compared across the two time periods to reveal any observed changes in the trend. The chosen method is ordinary least squares (OLS).\(^\text{12}\) Three different regressions are performed to evaluate the importance of various factors on the likelihood of switching from a defined benefit plan. The first regression focuses on the probability of converting to a defined contribution plan. The second regression is identical, but instead looks at the probability of converting to a cash balance plan. Finally, the third regression incorporates both defined contribution and cash balance

\(^{12}\) Ippolito and Thompson only intended for their estimates to be preliminary, so they used OLS because it offers the simplest way to interpret the coefficients. This study employs the same method for the sake of comparison.
plans to determine the probability of a switch away from a traditional defined benefit plan.

A number of dummy variables were created in order to construct this model. It is important to note that all of the data used to generate these regressions are taken from the 1995 plan year. The first factor considered is the size of the plan, as measured by the total number of participants. This number includes active participants, retired or separated participants receiving or who are entitled to future benefits, and deceased participants whose beneficiaries are receiving or are entitled to receive benefits. Two dummy variables were used. One included all plans with 250 to 999 total participants, and the other covered all plans with 1000 to 4999 participants. The second factor in the model was firm size. The dummy variables for firm size were created in the same way as those used for plan size. There were some plans that failed to report the number of employees of the sponsoring firm. These were accounted for in the model by an additional dummy variable.13

In their model, Ippolito and Thompson included a variable they called relative maturity. The model in this paper considers relative maturity as well. Specifically, this variable is a measure of the percentage of retired or separated participants in each plan as compared with the average percentage from the entire sample. The value was calculated by first taking the sum of the retired and separated participants for the plan. Then this number was divided by the total number of participants. Carrying out this computation generated a maturity value for each plan. The next step was to compute the average maturity value for all of the plans in the sample. This average value, \( m \), was then

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13 This coefficient does not contribute to the analysis, so it is not reported in the regression results. There were 99 plans in the sample that did not report the number of employees in the firm on the Form 5500.
subtracted from the individual maturity variables, $m_i$, such that the relative maturity for each plan was expressed as follows: $m^*_i = m_i - m$. This is the only variable in the model that is not a dummy variable.

The few factors that Ippolito and Thompson found to be statistically significant happened to be industrial classification variables. The model used in this paper features a very similar set of dummy variables for the various industry groups represented in the plan sample. The groupings were determined using the “Codes for Principal Business Activity and Principal Product or Service” which are reported on the Form 5500.\(^{14}\) The dummy variables created were the following: Medical and Health Services; Other Services; Finance, Insurance, and Real Estate; Wholesale and Retail Trade; Transportation; and Other Industry.

The final dummy variable that was added to the model indicated whether the sponsoring firm was subject to one or more collective bargaining agreements. Unions tend to favor defined benefit pensions, so this can be a strongly influential factor in a firm’s decision to change pension coverage. Nevertheless, Peterson (1989) found that unionization was not a statistically significant variable in determining the probability of defined benefit terminations between 1980 and 1986. Ippolito and Thompson (2000) reached the same conclusion for the period between 1987 and 1995. A variable for union status is included in this model to check if unionization still fails to be statistically significant in affecting the chance of a defined benefit plan switch.

\(^{14}\) These delineations are based on the Enterprise Standard Industrial Classification System and are authorized by the Regulatory and Statistical Analysis Division, Office of Information and Regulatory Affairs, Office of Management and Budget. The 1995 Instructions for the Form 5500 contain a listing of these business codes.
DESCRIPTIVE STATISTICS

Before performing the regressions for the model, it is important to have a general sense of what the data look like with respect to these independent variables. The tables referenced below that represent these data counts are included in the Appendix. Grouping the sample plans by the independent variables reveals that, while some characteristics may not turn out to be statistically significant, there can be some economic significance that is overlooked by the model. The following sections consider each group of independent variables separately.

Plan Size

The first factor to review is plan size. Of the smaller plans (250 to 999 participants), 128 remained defined benefit over the period, 14 terminated in favor of defined contribution, 10 converted to cash balance, and 14 were terminated (Figure 5). Approximately 65 percent of the sample of plans fell into this size category, and over 14 percent of these smaller plans switched away from defined benefit coverage during the period. For those plans that had between 1000 and 4999 participants, 59 remained defined benefit, 3 became defined contribution, 8 changed to cash balance, and 2 were terminated (Figure 6). This size category accounted for roughly 28 percent of the sample of plans, and about 15 percent of these plans switched. There were 12 of the larger plans (those with 5000 and more participants) that remained defined benefit over the period, 1 that became defined contribution, and 3 that converted to cash balance (Figure 7). None of the plans in this size category terminated. This group of large plans represented only 6
percent of the plans in the entire sample, and 25 percent of the plans of this size changed pension type.

Notably, those plans that switched to defined contribution were predominantly of smaller plan sizes. There were 14 from the group of the smaller plans, 3 from the middle group, and only 1 from the group of the largest plans. Those pensions that terminated exhibited a very similar pattern – also 14 from the smaller plans and only 2 from the middle groups of plans. Cash balance plan conversions, on the other hand, tended to be more spread out across the various groups of plan sizes. While the greatest number of switches were still from the smaller plans (10 instances), there were also 8 plans from the middle group and 3 plans from the larger group that changed. This data suggest that, in the event that a firm chooses to switch away from its defined benefit pension, a larger plan is more likely to become cash balance than a smaller plan. Similarly, firms with smaller plans seem to be more inclined than firms with larger plans to terminate in favor of defined contribution pensions.

**Firm Size**

The second factor to review is the size of the sponsoring firm. Of the plans from smaller sponsoring firms (250 to 999 total employees), 37 remained defined benefit, 10 converted to defined contribution, 1 became cash balance, and 2 terminated (Figure 8). The plans of the smaller firms represent over 32 percent of the entire sample,\(^{15}\) and 22 percent of this group of plans moved away from defined benefit pension coverage. For those plans sponsored by firms with 1000 to 4999 employees, 59 remained defined

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\(^{15}\) There were 99 plans for which the number of employees of the sponsoring firm was not reported. These plans were not considered in calculating these percentages. Only the 155 plans that did report the number of employees were included.
benefit plans, 2 converted to defined contribution, 8 became cash balance, and 4 were terminated (Figure 9). This group of plans accounted for 47 percent of the entire sample, and nearly 14 percent of these plans were terminated in favor of either a defined contribution or cash balance plan. The plans sponsored by the largest firms (5000 and more employees) tended to remain defined benefit during this period. There were 27 plans unchanged, 1 that became defined contribution, 2 that were made cash balance, and 2 that were terminated (Figure 10). This group was 21 percent of the sample of plans, and only about 9 percent of the plans in this group changed from defined benefit to a different type of pension.

Since 39 percent of the total sample of plans did not report the number of employees in the sponsoring firm, the analysis of this factor is subject to some error. Nevertheless, there is an interesting point to note. The plans from firms of smaller sizes (250-999 employees) were far more likely to be converted to defined contribution plans instead of cash balance (10 instances versus 1). However, plans from firms with between 1000 and 4999 employees were far more likely to be converted to cash balance plans instead of defined contribution (8 instances versus 2). This supports a similar observation that was made about plan size. In the event of a switch from defined benefit, the smaller firm prefers the defined contribution option and the larger firm tends to favor cash balance amendments to its defined benefit plan. From a practical standpoint, it is logical that a small firm with a small pension would have an easier time completely switching the type of plan coverage. The value of the pension assets is less and there are fewer people affected by the change. However, larger firms with more plan participants may not be able to make this change as easily. Within this group, there are more instances
where the pension is modified to a cash balance plan in order for the firm to facilitate a smoother transition away from traditional defined benefit coverage.

*Industrial Classification*

Figure 11 summarizes the breakdown of the sample plans by industrial classification. Those plans sponsored by firms in the manufacturing sector were predominantly defined benefit with 119 plans falling into this category (82 percent). There were also 9 defined contribution plans, 7 cash balance plans, and 10 terminated plans. The pensions sponsored by firms in the manufacturing sector comprised 57 percent of the total sample. The firms classified as “Other Industry” almost exclusively remained defined benefit – 12 plans unchanged, 1 converted to cash balance, and 1 terminated. These plans only accounted for roughly 5 percent of the total sample. The plans sponsored by firms in the transportation sector (2 percent of the total sample) exhibited a similar trend – 5 remained defined benefit and 1 changed to defined contribution. Firms within the finance, insurance, and real estate sector had 17 plans that remained defined benefit, 2 that switched to defined contribution, and 3 that changed to cash balance. This industrial sector accounted for nearly 9 percent of all sample plans. Nearly 23 percent of the plans within this sector switched during the period – the second highest rate of all groups. The health services sector had the highest rate of defined benefit plan switches. Of this group, 21 plans remained defined benefit, 4 changed to defined contribution, 6 converted to cash balance, and 3 terminated. The health services sector accounted for over 13 percent of the entire sample, and 29 percent of these plans terminated in favor of either defined contribution or cash balance. Plans sponsored by
firms classified as “Other Service” mostly remained defined benefit – 11 unchanged, 1 defined contribution, 1 cash balance, and 1 terminated. The trade sector featured plans that were also mostly defined benefit at the end of the period – 14 unchanged, 1 defined contribution, 3 cash balance, and 1 terminated. This group represented just over 7 percent of the sample of plans.

The data indicate that industrial classification does have an impact on a plan’s probability of changing pension types. The plans sponsored by firms in the health services sector exhibit the largest chance of becoming either defined contribution or cash balance. Plans from firms in the finance, insurance, and real estate sector are also more likely to switch than those plans from other industrial sectors. While there were 16 plans from the manufacturing sector that changed pension type over this period (the greatest number of any industrial group), it should be noted that this is only 11 percent of the number of plans from this sector. The switch rate is over twice as high for plans sponsored by firms in the finance, insurance and real estate group, and almost three times as high for those plans from the health services sector. These two particular industry groups are much more likely to be statistically significant in the model.

**Unionization**

There were 56 plans out of the sample of 254 that indicated that the pension was “established or maintained pursuant to one or more collective bargaining agreements” (1995 Form 5500, question 13a). This represents 22 percent of the sample. The numbers reveal that plans affirming union status were likely to remain defined benefit over the period. There were 49 plans unchanged, 1 that switched to defined contribution, 4 that
became cash balance, and 2 that terminated (Figure 12). There were 9 percent of these plans that switched. However, since cash balance plans are still technically a type of defined benefit plan, essentially it was only one plan out of 56 that changed to a defined contribution pension. This supports the observation that the presence of a union tends to strongly influence decisions to maintain defined benefit pension coverage for employees.

EQUATION DESIGN

The dummy variables for the above factors have been created such that the “intercept” plan is one that has more than 5000 plan participants, is sponsored by a firm classified in the manufacturing sector with more than 5000 employees, has an average maturity value, and is nonunion. The independent variables are identical for all three regressions performed. The equation for the third OLS regression is given below, where the dependent variable represents those plans that switched to either defined contribution or cash balance plans:

\[
SWITCH = \beta_0 + \beta_1PSIZE1 + \beta_2PSIZE2 + \beta_3FSIZE1 + \beta_4FSIZE2 + \beta_5BLANKSIZE + \beta_6MATURITY + \beta_7Health + \beta_8OtherServices + \beta_9Finance + \beta_{10}Trade + \beta_{11}Transport + \beta_{12}OtherIndustry + \beta_{13}UNION + u
\]

ANALYSIS

The results from the three regressions are shown in Table 1. Column 1 provides an observation count for the various independent variables. Column 2 reports the coefficients describing the probability of replacing a defined benefit plan with a defined contribution plan. Column 3 reports the coefficients for the switch from a defined benefit plan.
to a cash balance plan. Finally, column 4 reports the results for the regression equation
given above. This looks at the probability of a defined benefit plan switching to either a
defined contribution or a cash balance plan. The coefficients are interpreted in the
following way. First, the coefficient for the intercept plan is noted. This is the
probability that the intercept plan will make the appropriate switch away from a defined
benefit plan. The other coefficients are then added to the intercept coefficient in order to
determine the effect of each factor on the probability of switching.

**Table 1: Factors Influencing Defined Benefit Plan Replacement**

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<th>Independent Variable</th>
<th>Observations (1)</th>
<th>Switch to DC (2)</th>
<th>Switch to CB (3)</th>
<th>Switch to Either DC or CB (4)</th>
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<td>0.12711</td>
<td>0.18908*</td>
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<tr>
<td></td>
<td>(0.84)</td>
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<td>Number of participants in plan</td>
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<td>(0.36)</td>
<td>(1.72)</td>
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<td>-0.02055</td>
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<td>% of non-active participants (minus sample average)</td>
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<td>0.16888**</td>
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<td>(2.86)</td>
<td>(2.35)</td>
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<td>(0.44)</td>
<td>(0.56)</td>
<td>(0.11)</td>
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<td>0.09721</td>
<td>0.0995</td>
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<td></td>
<td>(0.04)</td>
<td>(1.47)</td>
<td>(1.14)</td>
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<td>(1.73)</td>
<td>(0.79)</td>
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<td>-0.08835</td>
<td>0.02042</td>
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<td></td>
<td>(0.99)</td>
<td>(0.74)</td>
<td>(0.13)</td>
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<td></td>
<td>56</td>
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<td>-0.10266</td>
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<tr>
<td></td>
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<td>(0.83)</td>
<td>(1.56)</td>
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<td>Number of plans with unit dependent variable</td>
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<td>39</td>
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**Note:** |t-values| in parentheses

* Statistically significant from zero at the 90% confidence level

** Statistically significant from zero at the 95% confidence level
The first regression in column 2 shows that the intercept plan (a plan with 5000 or more participants, sponsored by a firm in the manufacturing sector having 5000 or more employees, of average relative maturity, and nonunion) had a 6.2 percent chance of switching to a defined contribution plan. The only statistically significant factor for this regression is the variable for the firm size of 250 to 999 employees. The probability of switching to a defined contribution plan for a firm with 250 to 999 employees was 16.8 percent higher than the intercept plan. This result is consistent with the observation from the data that smaller firms tended to favor switches to defined contribution plans. The coefficients also indicate that both unionization and relative maturity negatively affect the likelihood of switching. Union plans were 6.1 percent less likely than the intercept plan to switch. While this particular result is not statistically significant, keep in mind that there was only one union plan out of the entire sample that terminated in favor of a defined contribution plan over the study period. Consequently, union status is certainly an economically significant factor in the decision to switch from a defined benefit plan. A negative coefficient for the percentage of non-active participants of approximately 0.12 indicates that relatively older plans have a lower probability of changing pension coverage to defined contribution. The remaining factors were not at all statistically significant. However, the signs of the coefficients tended to be consistent with the results from the data observations. For instance, the coefficients for larger plan sizes and larger firm sizes were negative. This makes sense because there were not many large firms with large plans observed switching pension coverage to defined contribution.

The results in column 3 show that the intercept plan had a 12.7 percent chance of being amended to have cash balance features. The health services sector coefficient for
this regression was found to be statistically significant at the 95 percent confidence interval. A plan whose sponsoring firm was classified as health services was 15.5 percent more likely to switch to cash balance than the intercept plan. The wholesale and retail trade sector coefficient was also found to be statistically significant, but only at the 90 percent confidence interval. Plans for firms in this industry group were 12 percent more likely to convert to cash balance than the intercept plan. Both coefficients for plan size are also statistically significant at this confidence interval, but are largely negative. A plan having between 250 and 999 participants was 14.3 percent less likely to switch than the intercept plan, and a pension with 1000 to 4999 participants was 13.5 percent less likely. These two coefficients do not clearly relate to the data observations. However, it should be noted that the value of the coefficient for the intercept plan is quite large. Thus, when considered in conjunction with the negative values for plan size, the intercept plan with 250 to 4999 participants has roughly a 1 percent chance of not changing to a cash balance plan. The recalculated probability now seems to fit the data observations much better. This point is important to keep in mind when analyzing the coefficients in column 4 as well.

The main focus of this model is on the regression results reported in column 4. These coefficients indicate the overall probability of making the switch away from a traditional defined benefit plan. The intercept plan itself was found to be statistically significant at the 90 percent confidence interval for this regression. This plan had an 18.9 percent chance of switching pension coverage. The plan size coefficients are negative, as was the case with the cash balance regression in column 3. The same point applies about taking the intercept plan in conjunction with these plan sizes. For this regression, the
coefficient for the intercept is 0.19 and the coefficient for a plan size of 250 to 999 participants is -0.18. This yields about a 1 percent chance of an intercept plan with 250 to 999 participants changing pension coverage.

Again, the health services sector coefficient was found to be statistically significant at the 95 percent confidence interval. Sponsoring firms within the health services sector were nearly 17 percent more likely to terminate their defined benefit plans in favor of a different type of pension. The firm size of 250 to 999 employees was also found to be statistically significant at the 90 percent confidence interval. Plans in this group were 14.8 percent more likely to switch pension type than the intercept plan. The coefficient for union status is close to being statistically significant. Plans covering unionized workers were roughly 10 percent less likely to terminate defined benefit coverage in favor of defined contribution or cash balance pensions.

This study demonstrates that both plan size and firm size play a more important role in affecting the likelihood of switching plans than was the case between 1987 and 1995. These results are somewhat different from those of Ippolito and Thompson (2000). They concluded that these size variables were not significantly related to the decision to switch the type of pension coverage. The study in this paper, however, found that both the coefficient for the small plan size group and the coefficient for the small firm size group were statistically significant at the 90 percent confidence interval. For the regression involving the switch to defined contribution only, small firm size was the only statistically significant factor. The likely reason for this difference between the studies is that Ippolito and Thompson limited their plan size to 500 and more participants, whereas this study included plans with 250 and more participants. Thus, by initially selecting a
relatively disproportionate number of smaller plans, this study was able to show that the size variables can significantly impact the decision to switch pensions, especially the choice to convert to a defined contribution plan.

There is one striking similarity between the two studies. Both these results and those of Ippolito and Thompson confirm that firms in the health services industry group are more likely to terminate in favor of a different type of pension coverage. The value for this study (17 percent) was not as much as that of the previous study (23 percent). Nevertheless, this coefficient was very statistically significant in both studies, yielding the highest t-values of any variable in all of the regressions performed. The data observations also confirm these econometric results. Ten of the 34 plans sponsored by firms in the health services sector terminated in favor of defined contribution or cash balance plans. This was a notably higher percentage than for any other group. Ippolito and Thompson correctly point out that it is this particular subset of the service sector that has been driving the observed increase in defined contribution coverage for the service sector as a whole.

The results from this model are not at all meant to be wholly explanatory of a firm’s decision to terminate a defined benefit plan in favor of different types of pension coverage. Very few of these variables were statistically significant at the 95 percent confidence interval. Furthermore, the R-square values were small for all three regressions (0.0900 for column 2, 0.0821 for column 3, and 0.0652 for column 4). It also seems that there had to have been at least one large plan from a large nonunion manufacturing firm that terminated in favor of a cash balance plan. This would explain why the intercept value was so much higher for the regressions in column 3 and column
4. This distorted the size coefficients by making them largely negative in order to compensate for the apparent outlier. Perhaps the selection of a different random sample would have avoided this problem. Nevertheless, these results do confirm that there is an increased likelihood of firms in the health services sector to change their pensions, and also reflect an increasing importance of plan and firm size in the decision to switch.

CONCLUSIONS

SUGGESTIONS FOR FURTHER RESEARCH

The methodology utilized in this research involves matching a sizeable sample of defined benefit plans across a six-year time period in order to determine if there were any changes in plan type. Tracking plans in this manner was a time-consuming task, and it was also one that failed to reveal all of the underlying reasons behind the trend away from defined benefit pension coverage. For example, a problem that has been noted in the literature is that the primary pension plan offered by a company is not evident from the Form 5500 data (Gustman and Steinmeier 1992 and Ippolito and Thompson 2000). More specifically, there were instances where a firm’s defined contribution plan exhibited significant growth and had a substantial amount of net assets. This firm also continued to offer a defined benefit plan, albeit of a smaller size. This study counted such an occurrence as a plan that remained defined benefit over the period. However, the sponsoring firm clearly seems to favor defined contribution coverage. The employer may even be encouraging its employees to participate in the defined contribution plan by offering a high match rate. The issue is that the results may overstate the relative importance of defined benefit plans by not accounting for secondary plan growth. The
solution to this problem involves turning to sources other than the Form 5500 to
determine which type of pension is primary for those firms offering multiple plans. This
information could be contained within the firm’s annual report, for instance. Future
studies should note any firms with secondary plans and pay close attention to determine if
there has been a shift in the type of pension offerings in spite of plan terminations.

Another worthwhile investigation would be looking at how firms structure their
benefit offerings in order to keep workers employed for as long as possible with the firm.
Over the past half century, the defined benefit pension plan has been the primary feature
in achieving this kind of worker loyalty. Today, many employers are utilizing stock
options as a way of retaining their workforce. Until the options become vested, they are
worthless to the employee. This motivates the worker to remain with the firm during the
vesting period, such that the benefits become valuable. Future research could attempt to
answer the question of whether or not vested options are an effective replacement of
defined benefit pensions with respect to retaining workers. A related point would be an
analysis of how effective defined benefit plans are today in achieving this objective of
keeping workers employed with the same firm over time.

FINAL THOUGHTS

The first part of this analysis dealt with tracking a longitudinal sample of plans
between 1995 and 2001. The results revealed that, on a participant-weighted basis, 10
percent of defined benefit plans terminated coverage in favor of either defined
contribution or cash balance pensions. The reason why this overall percentage was
higher than that determined by both Ippolito and Thompson (2000) and Kruse (1995) was
not the result of an increase in the number of defined benefit plans terminating in favor of defined contribution plans. Rather, there was an observed increase in the number of plans that converted to cash balance over this period. The appeal of cash balance plans was enhanced by the prevailing bull financial markets of the late 1990s. It was also revealed that larger plan size and firm size led to more cash balance follow-on plans in the event of a defined benefit termination. This is likely due to fact that cash balance amendments, while they do reflect a movement away from traditional defined benefit coverage, are still not technically considered to be defined contribution. Thus, it seems easier for these larger firms to modify their pensions in this way rather than radically change their pension coverage.

Ippolito and Thompson noted that defined benefit plans have been consolidating, such that plan sizes increase while the overall number of defined benefit plan participants remains relatively stable. This was also the case in this study. While it is difficult to specifically record, the process of hand-checking the data revealed that many plans that remained defined benefit had combined with other existing defined benefit plans. If this trend continues, the problems with properly valuing pension liabilities will become an even more important issue for reform. Larger plans tend to be more susceptible to problems of underfunding. For instance, in 2001, the General Motors Corporation defined benefit pension, one of the largest pension plans, was underfunded by nearly $13 billion (85 percent funded) while Delta Airlines Inc., another large plan, had underfunding of about $2.5 billion (72 percent funded) (CSFB estimates in Prescott and Sylvestre 2003). From the end of 2000 through 2002, S&P 500 firms as a whole saw their defined benefit pension assets fall by $108 billion. During the same period, pension
liabilities ballooned by about $200 billion (Prescott and Sylvestre 2003). Congress recently passed H.R. 3108, the “Pension Stability Act.” This bill temporarily replaces the 30-year Treasury rate specified by ERISA and the Internal Revenue Code with a higher discount rate based on conservative long-term corporate bonds. However, this increase in the discount rate is only designed to offer immediate relief for struggling firm sponsors. All of these underfunded large plans cannot be taken over by the PBGC, so some sort of permanent reform will have to be instituted in the near future if these large defined benefit pensions are to correct their current level of underfunding and survive.

A concluding point is that the trend observed between 1995 and 2001 does not generally contradict the findings in previous research. Ippolito and Thompson concluded that sponsoring firms were reluctant to terminate defined benefit plans in favor of defined-contribution-type plans between 1987 and 1995. This was what Kruse found to be the case from 1980 to 1986. Between 1995 and 2001, it was also true that the growth in defined contribution coverage was not significantly due to the defined benefit plan terminations. A stronger argument could be made with respect to increases in cash balance plan coverage, but amending defined benefit plans in this way was still a relatively rare event in the sample data. Nevertheless, the overall trend is still decidedly moving away from defined benefit pension coverage. There were notably more terminations of defined benefit plans during this most recent period. Also, the growth of secondary plans was not taken into account by this study. The future pension reforms may help to accelerate this trend by further increasing the costs and uncertainty facing employers with respect to defined benefit plan administration. Given that defined benefit plans are still offered as retirement savings for millions of Americans, there will be
numerous opportunities to continue to study this trend and explore the motivating factors for changes in pension coverage.
APPENDIX

Figure 5: Number of Plan Participants (250-999)

- Defined Benefit, 128
- Defined Contribution, 14
- Cash Balance, 10
- Terminated, 14

Figure 6: Number of Plan Participants (1000-4999)

- Defined Benefit, 59
- Defined Contribution, 3
- Cash Balance, 8
- Terminated, 2

Figure 7: Number of Plan Participants (5000 and more)

- Defined Benefit, 12
- Defined Contribution, 1
- Cash Balance, 3
- Terminated, 0
Figure 8: Number of Employees in the Sponsoring Firm (250-999)

- Defined Benefit: 37
- Defined Contribution: 10
- Cash Balance: 1
- Terminated: 2

Figure 9: Number of Employees in the Sponsoring Firm (1000-4999)

- Defined Benefit: 59
- Defined Contribution: 2
- Cash Balance: 8
- Terminated: 4

Figure 10: Number of Employees in the Sponsoring Firm (5000 and more)

- Defined Benefit: 27
- Defined Contribution: 1
- Cash Balance: 2
- Terminated: 2
Figure 11: Industrial Classification by 2001 Plan Type

Figure 12: Unionized Plans
REFERENCE LIST


