Negotiating with Labor under Financial Distress*

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Abstract

We analyze how firms strategeically renegotiate labor contracts to extract concessions from labor. While anecdotal evidence suggests that firms tend to renegotiate down wages in times of financial distress, there is no empirical evidence that documents such renegotiation, its determinants, and its magnitude. This paper attempts to fill this gap. Using a unique data set of airlines that includes detailed information on wages and pension plans we document an empirical link between airline financial distress, pension underfunding, and wage concessions. We show that airlines in financial distress obtain wage concession from employees whose pension plans are underfunded. As part of our identification strategy, we exploit the fact that pension plans in the U.S are partially insured by the Pension Benefit Guaranty Corporation (PBGC). Using variation in the degree of pension coverage provided by the PBGC, we show that employees' outside option in bargaining is crucial in determining the degree of wage concessions during labor conract renegotiation. Our empirical evidence highlights the strategic use of pension underfunding by firms and the resultant wage cuts which employees endure as a result.

I. Introduction

We analyze how firms strategeically renegotiate labor contracts to extract concessions from labor. While anecdotal evidence suggests that firms tend to renegotiate down wages in times of financial distress, there is no empirical evidence that documents such renegotiation, its determinants, and its magnitude. This paper attempts to fill this gap. Using a unique data set of airlines that includes detailed information on wages, benefits and pension plans we document an empirical link between airline financial distress, pension underfunding, and wage concessions.

Previous research on the interaction between finance and labor has documented that unionized firms maintain low levels of cash and high leverage as a mechanism to reduce union demands from firms. However, much less is known on the ability of firms to renegotiate labor contracts and in particular the role that finance plays in such negotiations. To analyze this question, we focus on the threat of 'pension dumping' in which during wage renegotiation firms threaten to default on their pension obligations, thereby reneging on the promise of future retirement benefits to workers.[1]

We first show that airlines in financial distress obtain wage concession from employees whose pension plans are underfunded – i.e. plan assets are insufficient to cover outstanding liabilities. Since employees with underfunded pension plans bear a higher cost when firms default, their outside option in the event of default is reduced. Therefore, in bargaining, management can employ the threat of 'pension dumping' to extract greater concessions from labor. We then exploit, as part of our identification strategy, the fact that pension plans in the U.S are partially insured by the Pension Benefit Guaranty Corporation (PBGC) – a federal corporation which protects the pensions of nearly 44 million American workers. While most defined benefits pensions in the U.S. are insured by the PBGC, this coverage is limited. The maximum annual guarantee is determined by employee age and was $30,978 for a 60 year-old employee in 2006. Since highly-paid employees with promised pensions that exceed the PBGC guarantee stand to lose more when their pension is dumped, we hypothesize that they will be more likely to make concessions during labor bargaining.

Our identification strategy thus relies on a triple-difference, or DDD, specification, with three levels of differences: (i) financially distressed vs. non-distressed airlines, (ii) underfunded pension plans vs. funded plans, and (iii) wages exceeding vs. those that are below the PBGC limit. Consistent with our hypotheis, we find that airlines that are financially constrained can negotiate

[1] See Hawthrone (2008) for a detailed description of the pension dumping phenomenon.

down the wages of their employees whose pensions are underfunded and are not fully covered by the PBGC guarantee. The magnitude of the triple difference estimator sugessts that in such renegotiation annual wages are reduced by between 9.3% and 11.2%. Analyzing levels instead of the percentage change shows that in renegotiation financially constrained airlines with underfunded pension plans extract between $12,252 and $17,360 in annual wages from employees not fully covered by the PBGC guarantee. Our results are robust to the inclusion of year, airline, plan and airline-by-year fixed effects in addition to airline and employee controls.

One concern with the identification strategy is that the DDD estimator is just picking-up those employee groups that account for a larger share of the airline wage expenses and hence have larger margins to make concessions. For example, according to this alternate hypothesis, firms in financial distress can negotiate highly paid pilots' wages downwards not because of the fact that their pensions are not covered by the PBGC and hence their bargaining position is weaker but simply because pilots have larger slack in which to make wage concessions. We address this concern in two ways. First, we control throughout our analysis for the ratio between the wage of an employee group and overall wage expenses and find that our results are always robust to the inclusion of the wage share variable. Second, we employ a placebo test to analyze the effect of the PBGC guarantee. Specifically, we compare renegotiation in airlines with deeply underfunded plans (the treatment group) to wage renegotiation in similar employee groups in airlines with no defined-benefits plans (the placebo group). We find that amongst highly paid employee groups with wages not fully covered by the PBGC guarantee, only those with a pension plan, and in particular one that is underfunded, agree to accept wage reductions in renegotiation. In contrast, identical highly paid employee groups employed in airlines without defined benefit plans do not accept wage cuts in renegotiation. Thus, our results are not likely driven simply by some employee groups making wage concessions for reasons unrelated to pension underfunding.

Our paper is most closely related to Ippolito (1985) which was the first to argue that firms may deliberately underfund their pension plan despite an associated tax disadvantage in order to deter their labor unions from holding-up the firm. We provide *direct* evidence on the actual mechanism in which airlines use underfunded pensions and the threat to dump those pensions in order to extract labor concessions in and out of bankruptcy.[2]

[2]Our paper is also related to Petersen (1992) who shows that firms decide to terminate *over-funded* pension plans in order to transfer wealth from employees to shareholders.

Earlier research on the intersection between corporate finance and labor economics has conjectured that debt can be used strategically to control wage demands and that unionization levels are correlated with leverage at the industry level (Baldwin (1983), Bronars and Deere (1991), Perotti and Spier (1993)). Similarly, using firm-level data, Hanka (1998) finds that debt is negatively correlated with wages, employment and pension funding, Hirsch (1991) and Cavanaugh and Garen (1997) find evidence that leverage is positively correlated correlated with unionization rates, and Klasa, Maxwell, and Ortiz-Molina (2008) show that firms in more unionized industries hold less cash. However, while making important empirical contributions, the results reported in these papers may be driven by an omitted variables bias in which industries with higher unionization rates also have higher debt capacity for different reasons. This concern has been alleviated recently by Matsa (2009) who shows, using exogenous variation in state-level labor laws, that once states adopt legislation that reduces union bargaining power, firms with concentrated labor markets reduce debt relative to otherwise similar firms in other states. While all of this empirical evidence hinges on the notion that firms set their financial position *ex-ante* in order to be in a better bargaining position *ex-post*, there is no empirical evidence for the role that financial distress plays in actual ex-post wage renegotiations. Our paper adds to this literature by analyzing renegotiations ex-post, identifying the conditions under which firms can successfully use their financial position to extract surplus from labor. In particular, our paper is the first to provide micro-evidence on within-firm wage renegotiations and their relation to financial distress and pension underfunding.

The rest of the paper is organized as follows. Section II analyzes a simple contract-renegotiation model based on Hart and Moore (1994). Our model generates three intuitive predictions which are then tested in the data. Section III provides a case study analyzing wage renegotiation in Delta Airlines between 2003 and 2006 and the role that the threat of 'pension dumping' played in the negotiations between management and Delta's pilots. Section IV provides a description of our data sources and summary statistics. We detail our identification strategy in Section V. Sections VI and VII describe the empirical analysis. Section VIII concludes.

II. The Model

This section develops a simple model analyzing labor contract renegotiation between a firm's management and its employees in the spirit of Hart and Moore (1994). Our goal is to analyze the

conditions under which management can successfully renegotiate labor contracts with workers and the payoffs obtained by parties in any successful renegotiation. The relative sizes of pension liabilities, pension funding, and pension guarantees will play a key role in the renegotiation outcome, as these are key in determining the value of labor's outside option in negotiation. The model provides three intuitive predictions: First, in order for management to successfully extract any concessions from labor, the firm's financial position must be sufficiently poor. Second, conditional on management extracting concessions from workers, greater pension underfunding reduces workers post-renegotiation payoff, but, third, the sensitivity of worker payoffs to underfunding is reduced when government pension guarantees are larger.

A. Setup

Consider a firm that is run by management representing shareholders and that employs labor to generate earnings. The model is comprised of two periods. In the first period the firm is assumed to have free cash flow of C_1 – representing cash owned by the firm net of all payments, including wages, already made by the firm. In period 2, the firm will generate cash flow of C_2. To approximate the situation faced by large publicly traded firms in the U.S., all cash flows are assumed to be non-expropriable.

Prior to period 1, workers and management are assumed to have signed a contract stipulating that, conditional on continued employment at the firm at period-2, workers will obtain a wage of W. As our focus is on contract renegotiation, the model does not analyze the ex-ante choice of W (i.e. prior to period 1) but rather takes it as exogenous.[3] For simplicity, we assume that $C_2 > W$, so that the firm always has enough funds to pay its wage obligation in period 2.

In addition to their promised wage, workers are owed an amount P in defined pension benefits in period 2. In period 1, the pension plan is funded by the firm to an amount F, where F can be either larger or smaller than P. In the latter case, the pension plan is underfunded. To capture in a simple manner the fact the firms are required to make mandatory contributions to pensions plans, we assume that if labor's pension plan is underfunded in period 1, then in period 2, after having paid W in wages, the firm must use remaining cash balances to fully fund the pension.[4]

[3]The wage, W can be thought of as committed to ex-ante, prior to period 1, when realizations of C_1 and C_2 are still uncertain. Then, at period 1, uncertainty is resolved, and parties decide whether to renegotiate the contract based on the analysis presented herein. For a similar analysis pertaining to financial contract renegotiation, see Benmelech and Bergman (2008).

[4]Firms are required to make contributions to their defined benefit pension plans by the Employee Retirement

The level of funding at period 2 is then equal to $min[C_1 + C_2 - W + F, P]$.

To model the PBGC – a federal corporation which protects the pensions of nearly 44 million American workers – we assume that the government guarantees labor's pension up to an amount G.[5] Thus, in the event that the pension plan is underfunded and labor does not obtain its full pension benefits of P, the government will fund the pension plan up to G. We assume that the pension plan is first funded by the firm's available cash and only then funded by the government guarantee.[6] For ease of exposition, we further assume that $G \leq P$ and that $G \leq C_1 + C_2 + F$. The former assumption implies that the pension guarantee does not cover the full amount owed to labor in pension benefits, while the latter implies that the pension guarantee is not larger than the firm value (gross of promised wages). Disposing these assumptions does not change our results at all but increases the number of cases that need to be dealt with.

Our model captures the essence of the insurance provided by the PBGC. While most defined benefits pensions in the U.S. are insured by the PBGC, coverage is limited. The maximum annual guarantee is set by Congress and is determined by employee age – in 2006, for example, the maximal annual guarnatee for a 60-year old employee was $30,978. According to the Employee Retirement Income Security Act of 1974, if a firm seeks to terminate an underfunded plan it must convince the PBGC that it is in financial distress.[7] If the PBGC agrees, it makes an assessment of the size of the pension funding deficiency. If the plan's assets are large enough to cover all of the PBGC-guaranteed benefits, then the PBGC mandates the plan administrator to proceed to distribute the plan's assets in the specific order described by law. After the distribution is complete, the involvement of the PBGC in the termination is over. If the plan's assets are not sufficient to cover all of the PBGC-guaranteed benefits, then the PBGC takes over the plan as a trustee, transferring to itself all of the plan's assets. From this point on, the investment and administration of the funds is performed by the PBGC as the plan's trustee, with the obligation that it transfer to each plan beneficiary the guaranteed portion of her pension for life.[8]

Income Security Act of 1974. See Rauh (2006a) for an analysis of the consequences of mandatory contributions for firm's investment policies.

[5]See Brown (2008) for a detailed description and account of the PBGC.

[6]This follows the mandate of the Employee Retirement Income Security Act of 1974.

[7]There are three criteria in which a distressed termination may be accepted by the PBGC: 1) liquidation in bankruptcy or insolvency proceedings; 2) reorganization in bankruptcy or insolvency proceedings; and, 3) termination is required to enable the payment of debts while remaining in business or to avoid unreasonably burdensome pension costs caused by a declining workforce.

[8]Even when a plan is trusteed by the PBGC, there are workers that have accrued pension benefits that are smaller than the PBGC guaranty. These workers receive their accrued benefits from the PBGC. The beneficiaries

The timing of events in the model is quite simple. At period 1 management decides whether to abide by its presigned labor contract or trigger renegotiation with labor. If management abides by the contract and does not trigger renegotiation, the firm reaches period 2 and generates C_2 in cash flow. It then pays out wages W and funds the pension plan as described above. To the extent that the pension plan is not fully repaid, the PBGC provides its pension guarantee up to an amount G as described above. Any remaining cash balances are then dispersed to shareholders.

If management does decide to trigger contract renegotiation, the outcome is based on Nash bargaining, with management assumed to have bargaining power μ. As in Hart and Moore (1994), we assume that management has human capital which is crucial for the ongoing success of the project. In order to extract concessions from labor, management can therefore threaten to withdraw its human capital, liquidate the firm, and dump the pension plan.[9] Thus, in attempting to renegotiate the labor contract, management is in essence threatening labor with the firm's demise, and with it, the inability of the firm to pay wages and pension benefits. Labor's (off-equilibrium path) outside option in bargaining will then be determined solely by the available free cash flow and pension funding at period 1 – C_1 and F, respectively – as well as by the size of the PBGC pension guarantee, G.[10]

B. Contract Renegotiation, Pension Underfunding, and Pension Guarantees

In this section we solve for the equilibrium of the game described above. To do so, we analyze under what conditions management decides to trigger renegotiation. Consider the following cases:

I. $P \leq C_1 + F$:

Under this scenario, pension underfunding $(P - F)$ is smaller than the period-1 cash balances of the firm. Thus, even if the firm is liquidated, labor obtains its full promised commitment of P. Management then obtains the difference $C_1 + F - P$. While these two values represent the

that actually obtain the maximum guaranty are those with accrued benefits larger or equal to the relevant PBGC guarantee.

[9] Alternatively, one can assume that negotiation takes the form of an alternating offer bargaining game, where during negotiation, the firm's continuation prospects continuously decline. The Nash bargaining outcome will then corresponds to the subgame perfect equilibrium of the alternating offer game. Thus, when the payoffs to initiating the alternating offer game are higher than those of abiding by the contract, triggering negotiation is indeed a credible threat of management. For an analysis along these lines see Benmelech and Bergman (2008).

[10] As an alternate assumption one can assume that the firm is able to threaten labor that it will dump the pension plan without being liquidated. However, with such an assumption, there must be an exogenous cost to pension dumping, since otherwise pension dumping would always be optimal. This exogenous cost could stem from a loss of firm reputation and an increased need in monitoring by workers.

respective outside options of the two parties, the surplus from continuing to period 2 is C_2. Thus, conditional on management triggering renegotiation, labor obtains $P+(1-\mu)C_2$. Since management needs to pay labor $P+W$ if it abides by the contract, it will prefer to trigger renegotiation when $(1-\mu)C_2 < W$. Thus, if C_2 is sufficiently high, management prefers to abide by the contract since labor obtains a relatively high fraction of the continuation rents. Importantly, in this region (i.e. when $P < C_1 + F$) the payoff to labor is independent of changes in the degree of pension funding, F. If management abides by the contract, labor is paid in full, while if management renegotiates, pension funding is irrelevant since (1) labor's outside option is to obtain full payment on its pension and (2) the surplus, C_2, is also independent of funding status. We thus have:

Lemma 1. *If $P \leq C_1 + F$, renegotiation occurs only when $(1-\mu)C_2 < W$ and labor's payoff is independent of pension funding F.*

II. $C_1 + F < P$:

In this region, the period-1 assets of the firm are not sufficient to cover the firm's pension obligations. This has two implications. The first is that in renegotiation management's outside option is zero. The second is that since the pension plan is not fully funded, if the firm liquidates in period 1, the size of the pension guarantee may play a role in determining payoffs – it will affect both the surplus from continuing to period 2 as well as labor's outside option in renegotiation. To analyze these effects, we divide this region into two cases:

IIa. $G \leq C_1 + F < P$:

In this region, labor's outside option in renegotiation is to obtain $C_1 + F$, all in the form of pension benefits. Since the pension guarantee G is too low compared to the funds available for pension repayment, it does not provide any benefit to workers, and hence plays no role in determining payoffs. Since the surplus from continuation is C_2, labor will obtain $C_1 + F + (1-\mu)C_2$ in renegotiation. Management triggers renegotiation therefore when $C_1 + F + (1-\mu)C_2 < P + W$. Thus, since in this region $C_1 + F < P$, renegotiation will occur when the firm's future prospects, C_2, are suffecintly low compared to the precontracted wage obligation, W. Indeed a sufficient condition for renegotiation is $(1-\mu)C_2 < W$. If renegotiation does occur, labor's payoff decreases one-for-one with reductions in pension funding, F: In this region, period-1 assets do not cover pension liabili-

ties and the pension guarantee is too low to be relevant. Thus, reductions in pension funding, F, are directly translated into reductions in labor's outside option, $C_1 + F$, and hence also into labor payoffs.

Lemma 2. *If $G \leq C_1 + F < P$, renegotiation occurs when $(1-\mu)C_2 < W$. If renegotiation occurs, labor's payoff decreases one-for-one with reductions in pension funding, F.*

IIb. $C_1 + F < G < P$:

In this region, the pension guarantee G is comparatively high relative to the available period-1 assets of the firm. Because of this, labor's outside option in renegotiation is to obtain a payoff of G: The firm's period-1 assets do not cover its pension liabilities, implying that the PBGC funds the difference between G and $C_1 + F$. Further, because of the government guarantee, and in contrast to prior cases, the surplus from continuation to period-2 is now $C_1 + C_2 + F - G$.[11] Thus, if management triggers renegotiation, labor obtains $G + (1-\mu)(C_1 + C_2 + F - G)$. Management will decide to trigger renegotiation when $G + (1-\mu)(C_1 + C_2 + F - G) < P + W$. As in prior cases, a sufficient condition for renegotiation to occur is $(1-\mu)C_2 < W$ – i.e. that the firm's prospects are sufficiently poor compared to its obligations to labor.

If renegotiation does occur, reductions in pension funding reduce labor's payoff, but *less* than one-for-one. Indeed, as can easily be seen, a dollar reduction in funding reduces labor's ultimate payoff by only $1 - \mu$. This is due to the effect of the pension guarantee. Since the guarantee is sufficiently large, labor's outside option in renegotiation is fixed at G and protected from declines in pension funding, F. Still, a decline in F reduces the surplus from continuation to period 2, and labor bears a fraction $(1 - \mu)$ of this reduction. We thus have:

Lemma 3. *If $C_1 + F < G < P$, renegotiation occurs when $(1-\mu)C_2 < W$. If renegotiation occurs, labor's payoff decreases by $(1 - \mu)$ for every unit reduction in pension funding, F.*

Combining Lemmas 1 through 3 provides the following three predictions:

Prediction 1. *All else equal, the ability of management to extract concessions from labor in contract renegotiation is decreasing in the strength of a firm's financial position as proxied by firm current and future cash flows as well as its level of pension funding.*

[11] Recall that we assume for expositional simplicity that $G \leq C_1 + C_2 + F$.

Prediction 2. *If a firm's financial position is sufficiently poor to extract concessions from labor in renegotiation, increases in pension underfunding will reduce labor payoffs.*

Prediction 3. *The sensitivity of post-renegotiation labor payoffs to pension underfunding will be greatest amongst pension plans where the PBGC guarantee is relatively small compared to the pension obligations.*

III. Labor Negotiations and Pension Dumping in Delta Airlines: A Case Study

In this section, we briefly describe the negotiations between Delta Air Lines and the approximately 9,000 pilots represented by the Air Line Pilots Association (ALPA) that took place from 2003 until late 2006. We argue that Delta's ability to obtain substantial wage concessions from its pilots (and from its workers in general) was largely due to their highly underfunded defined benefit pension. This, together with the fact that the PBGC pension guarantee would cover a relatively small fraction of the underfunding, implied that pension termination meant billions of dollars in potential losses for pilots.[12]

A. The Prolonged First Negotiation

In July, 2001, Delta and ALPA's pilots signed a 5-years contract which would make Delta's pilots the highest paid in the industry and which included annual wage increases of 4.5%.[13] However, as a result of the downturn in the industry following the September 11th attacks, Delta asked ALPA in April 2003 for a 22% cut in pilots' hourly wages and the cancellation of the 4.5% annual raises due on May 2003 and 2004. Delta executives argued that this cut was necessary for the airline to remain competitive, especially since its two largest competitors, American Airlines and United Airlines, recently obtained considerable wage concessions from their labor unions.

What followed was a series of offers and counteroffers between Delta's management and the pilots union. Delta's initial bargaining position was not ideal. On the one hand, employee pension plans were underfunded by approximately $4.9 billion, implying that pension termination would

[12]This description relies on information obtained from articles in the Wall Street Journal, the Atlanta Journal-Constitution, the New York Times, the Associated Press, the Financial Times and the Dow Jones Business News.

[13]Three years later, in 2004, Delta pilots' average wage was $209,330 while Northwest pilots – the second highest paid in the industry – earned on average $169,208. Average wages of pilots in Continental, US Airways, United and American Airlines were $145,060, $132,715, $131,930 and $129,947, respectively.

be quite costly for labor. On the other hand, Delta's balance sheet was much stronger than that of American Airlines and United, making it more difficult to extract concessions from labor.[14] As negotiations drew on, however, the condition of the airline industry, and Delta in particular, continued to deteriorate, enhancing the firms bargaining position.

By December 2003, ALPA was offering a 9% pay cut plus the cancellation of the 4.5% increase due on May 2004. Management rejected this offer and by June 2004 was demanding a 30% reduction in pilot compensation. The pilot union countered with an offer to cut wages by 23%. By the end of July, with Delta's condition continuing to deteriorate, management answered with an increased pay cut demand of 35%, amounting to $1.02 billion a year in pilot concessions. Finally, in November 10, 2004, Delta's management and ALPA reached a deal involving a 32.5% wage cut, changes to work rules that would increase pilots' flying time, a switch to a cheaper retirement plan for younger pilots, and the freezing of the pilots' pension plan. In return, pilots received options on Delta stock as well as other profit sharing arrangements. Panel A of Table 1 displays detailed information on wages and pension plan funding status for pilots and non-pilots for the years 2004, 2005, and 2006.[15] Panel B of Table 1 shows the outcome of the renegotiations. Consistent with strategic renegotiation, pilots – whose average wages were much higher than the PBGC maximum guarantee – made wage concessions of 32.5%. In contrast, non-pilot employees were mostly covered by the PBGC guarantee and hence agreed only to a much smaller 10% wage cut.

B. The Second Negotiation

Four weeks after the $1 billion agreement, Delta's management returned to the bargaining table arguing that to avoid bankruptcy the pilots would need to agree to further concessions. The threat of bankruptcy was particularly acute to labor, as at the time, the airline's defined benefit pension plans were underfunded by approximately $3.3 billion (Table 1).

In the ensuing months, Delta unsuccessfully sought additional concessions from its pilots, and as a result, filed for Chapter 11 on September 14, 2005. Upon filing, Delta presented its unionized pilots with a new compensation plan calling for further annual concessions of approximately $325 million which included a 20% pay cut. Further, in October of the same year, Delta received permission from the bankruptcy court to halt pension payments to retirees.

[14] See The Wall Street Journal, July 23, 2003, "Delta Pilots Contract Talks Break Down."
[15] Data sources are described in detail in the next section.

By this time, Delta's pilots were highly concerned that the carrier would opt to terminate their defined benefit plan. Such termination would be quite costly for pilots – by the end of the year, Delta's estimated that its pension plans were underfunded by $4.6 billion. Further, because of pilots comparatively high wage and retirement benefits, the PBGC benefit guarantee would provide them with little coverage in the event of termination. As a result of what appeared to be a credible threat of plan termination, the pilot union agreed to re-open negotiations with Delta. Central to the negotiations was the future of the pilot pension plan.[16]

In March 2006, Delta asked its pilots for additional concessions worth $305 million a year for four years, including a 18% pay cut. ALPA's counteroffer included concessions amounting to $140 million a year and a demand for a $1 billion note from Delta payable in case the pilot pension plan was terminated. For the first time during negotiations, Delta's executives told the pilots that it was likely that the firm would terminate their pension plan. Finally, in June 2006, Delta's pilots ratified a 3.5 year agreement on concessions that included cost savings of $280 million a year with a 14% wage cut, reducing average pilot pay from $151,000 to just under $130,000 a year. Additionally, the new contract paved the way for Delta to seek termination of the pilots' pension plan. In return, Delta promised the union a $650 million payment and a $2.1 billion claim convertible into a yet-to-be-determined stake in the reorganized Delta.

C. The Pilot Pension Plan Termination

On September 1st, 2006, Delta requested that the bankruptcy judge allow the firm to terminate the pilots' pension plan and to transfer its liabilities to the PBGC. The judge approved the termination request on September 6th, thereby allowing Delta to avoid approxiamtely $3 billion in payments needed to bring the plan to full funding. Delta transferred $1.7 billion in assets to the PBGC to cover more than $4.7 billion in benefit liabilities. PBGC estimated that out of the $3 billion in underfunded pension liabilities it would be liable for $920 million, implying a loss of more than $2 billion for the ALPA pilots. As Panel A of Table 1 shows, the pilots' pension plans were more underfunded – arguably strategically – than those of the non-pilot employees. As a result, post-bankruptcy the pilots agreed to an additional wage concession of 14% compared to only 7.5% by non-pilots.

[16]Indeed, during one of the hearings in bankruptcy court, an ALPA attorney said to his Delta counterpart that "we'll go out in the hall and get a deal if the airline would gaurantee it would not terminate the pilot's pension plan."

IV. Data and Summary Statistics

This section describes the construction of our data set and displays summary statistics for the main variables in our analysis.

A. Sample Construction

We use two main data sources to construct our sample: (1) the Bureau of Transportation Statistics (BTS) data on individual airlines, and (ii) data on airlines' pension plans from the Department of Labor's form 5500. We also supplement these data with information from Compustat and from SDC.

A.1 Calculating Average Wages

Using the Air Carrier Financial Reports (Form 41 Financial Data) from the BTS, we obtain financial information as well as detailed data on airline employees and their compensation for large U.S. certified air carriers. We use Schedule P-6 from the BTS's Form 41 to obtain detailed information on wages for different job categories in airlines. Schedule P-6 provides operating expenses for air carriers with annual operating revenues of at least $20 million. The different job categories for which annual wage information is available are: (1) General Management Personnel; (2) Flight Personnel; (3) Mechanics & Maintenance; (4) Aircraft and Traffic Handling Personnel; and, (5) Other Personnel. We use the BTS's Schedule P-52 to calculate aggregate pilot wages, and then subtract this amount from the aggregate flight personnel's wages obtained from Schedule P-6 to obtain annual aggregate flight attendents wage.[17] We thus divide the Flight Persoanel group into two seperate subgroups – Flight Attendents and Pilots. This process yields annual wages for six seperate job categories which are used in our data analysis: (1) Pilots; (2) Flight Attendants; (3) Mechanics & Maintenance; (4) Aircraft and Traffic Handling Personnel; (5) General Management Personnel; and, (6) Other Personnel.

Next, we use Schedule P-10 from BTS's Form 41 to obtain detailed data on the number of employees per job category for the years 1990 to 2007. There are 15 different categories that group together employees with closely related jobs. We use the BTS Employment Categories Descriptions to assign each of the 15 employee categories to one of the six job categories described above.[18]

[17] Schedule P-52 contains operating expenses for each aircraft type for every carrier. By adding across aircraft types for every airline, we construct an aggregated figure for pilots' wages.

[18] See the Internet Appendix for a detailed description of job groups and categories.

For each of these six job categories we then divide total wages of the group by the number of employees in that group to obtain the average wage per employee in each job category. As a result, we obtain information on annual average wages per employee for the airline as a whole and for each of the six BTS job categories. Finally, for each employee job category we calculate the annual percent change and the annual dollar change in average wage per employee. .

A.2 Airline Financial Data

We continue by collecting earnings data from BTS Form 41's Schedule P-12. We define profitability as income before discontinued operations and extraordinary items plus depreciation and amortization divided by total assets. Using balance sheet data from BTS Form 41's Schedule B-1, we calculate leverage as total current liabilities plus long-term debt divided by total assets. We also obtain industry data from the BTS on average aircraft fuel cost for airlines and industry profitability. Finally, using Compustat data we construct yearly airline market-to-book ratios.[19]

A.3 Pension Plans Data

We obtain available data on all defined benefit pension plans covering employees of US airlines. Firms with defined-benefits pension plans are required to file Form 5500 with the IRS for each plan. Using all filings of Form 5500 in the years 1992 to 2006, we identify all defined benefit plans in the airline industry that have 100 or more active participants, and that are sponsored by a single employer.[20] We calculate the level of plan underfunding by subtracting the total assets of the plan from the current liability of the total benefits due to all plan participants.[21] We define a dummy variable for plan underfunding which takes on a value of one if a plan is underfunded and zero otherwise. As we are also interested in analyzing the effect of deep underfunding we define underfunding dummies for underfunding levels larger than 10%, 15% and 25% of plan assets. The Internet Appendix provides further details on the construction of these variables.

We continue by matching each defined benefit pension plan to one of the six BTS job categories (some plans are matched to more than one category as described below). This matching is then used to relate pension plan information, such as pension underfunding, to our main dependnet

[19]We cannot construct market-to-book ratios for airline-year observations in which airlines are not publicly traded firms.

[20]This last filter is important since in multi-employer plans it is not clear which firm actually carries out the labor negotiations. Nevertheless, the vast majority of airlines' defined benefit pension plans are single-employer plans.

[21]While other measures of underfunding exist, we use the common definition of underfunding used by the PBGC.

variable, the percent change in average wage per employee in each job category. In most cases, the match is straightforward since the pension plan includes the job title in its name (Pilots, Flight Attendants, Mechanics, etc). A second category is one in which some pension plans are linked to a specific labor union. In these cases, we analyze which of the airline's job categories (out of the six BTS categories) are associated with this specific union and calculate our dependent variables accordingly.[22] A third set of pension plans are specifically for non-unionized workers. For these cases we calculate the average wage per employee using all job groups that do not have a separate pension plan linked to a union. A fourth group of plans are "aggregate plans" in the sense that they cover all of the firm's workers without craft distinction.[23] In these cases, we calculate the average wage per employee for the firm as a whole. Finally, some airlines have only two plans: one for pilots and the other for all other employees. A fifth set of pension plans, therefore, are specifically for non-pilots. In these cases we calculate the relevant average wage per employee associated with the plan by aggregating all non-pilot job categories togther.

Matching the BTS and the Form 5500 data and restricting our sample to plans that have at least two observations, we end up with 559 plan-year observations corresponding to 14 different airliness.[24] Out of the 559 plan-year observations, 482 plan-year observations representing 12 airlines have market-to-book data.[25] We winsorize our dependent variable at the 0.5th and 99.5th percentiles (0.5% per tail) and also exclude observations with a Market-to-Book or Leverage value that is more than four standard deviations away from its corresponding mean. Six observations are dropped, leading to a final sample size of 476 plan-year observations spanning the years 1992-2006.

B. Data Characteristics and Summary Statistics

Panel A of Table 2 provides summary statistics on wages of airline employees. The average airline in our sample has 45,663 employees (median 39,952) and wages account on average for 24.1% (median

[22]For example, if a union includes both flight attendants and mechanics within an airline, the average wage is calculated as the sum of wages given to flight attendants and to mechanics divided by the number of employees in the flight attendants and mechanics employee groups. We then calculate the annual percent change in wages per employee for this "enlarged" group within the airline.

[23]Some firms have an aggregate plan on top of their craft plans, while other have only aggregate plans for their workers (as is the case with United Parcel Services and Federal Express).

[24]There are three small airlines (Astar Air Cargo, Markair Inc. and ABX Air) for which the available data allows us only to build a single observation per plan. They are excluded from the sample as most of our empirical specifications include either firm or plan fixed effects.

[25]The 12 airlines in our sample for which we have market-to-book data are: Alaska Airlines, American Airlines, Continental Airlines, Delta Airlines, Federal Express, Hawaiian Airlines, Midwest Airlines, Northwest Airlines, Trans World Airlines, United Airlines, United Parcel Services and US Airways. Aloha Airlines and Shuttle Inc are dropped as they do not have market-to-book data.

24.9%) of operating revenues for the airlines in our sample. While the average wage across all employees is $70,143 a year, there is a large dispersion in average wages across different employees groups. While the average wage of pilots is $125,203, flight attendants and mechanics earn on average $34,210, and $58,731, respectively. We also calculate wage shares for each of the employee groups defined as the ratio of wages of an employee group to the overall wage expenses of the airline. Finally, Panel A of Table 2 provides summary statistics on the percent annual change in average wages for each employee group which we use as our dependent variable in the regression analysis. As Panel A shows, the average annual increase in wages per employee in our sample is 3.8% (median 3.8%). The standard deviation of 12.6% points to the high variability in annual wage adjustments.

Panel B of Table 2 provides summary statistics for the explanatory variables used in our regressions. Starting with the underfunding dummy variables, Panel B demonstrates that on average 55.7% of the plan-year observations show some level of underfunding, while 38.9%, 34.0% and 22.1% of the plans are underfunded by at least 10%, 15% and 25% of the plan's total assets, respectively. The mean size (total assets) of an airline in our sample is $10.8 billion, and the average market-to-book ratio, leverage ratio and profitability are 1.25, 0.56 and 3.67%, respectively.[26] About 15.5% of our plan-year observations are linked to an airline in Chapter-11. As a measure of financial dificulties we define a low cash flow dummy that equals one for airlines in which cash flow from operations (income before extraordinary items + depreciation and amortization) plus cash balances are less than their interest expense, and 0 otherwise.[27] The average earnings plus cash balances are $336.0 million and the average interest expense is $231.8 million. This low cash flow dummy takes a value of one for 29.6% of the observations.[28]

Another important variable in our analysis is the maximal annual pension guarantee provided by the PBGC which provides monthly payments to retirees of terminated pension plans that were underfunded at the time of termination. This payment, however, is capped, at an amount that varies by employee age. Indeed, as can be seen in Panel B of Table 2, 43.5% of the observations have an average wage per employee that is larger than 1.5 times the maximum annual guaranteed payment offered by the PBGC for that year, and 33.8% earn more than twice the PBGC maximum

[26]Note that these averages are based on plan-year observations and hence the data is weighted by plan-year observations per airline.

[27]See Asquith, Gertner and Scharfstein (1994), and Benmelech and Bergman (2008) for similar approaches.

[28]Our analysis is robust to other definitions of low cash flow or low profitability.

guarantee.[29]

V. Empirical Strategy

The wage structure of the airline industry and in particular the clear disparity in pay levels across job categories, combined with the financial difficulties and frequent bankruptcy filings of air carriers make the airline industry a natural setting to test the relation between financial distress and labor negotiations. Furthermore, the fact that most of the legacy carriers in the U.S. are highly unionized and have traditionally offered defined-benefits pension to their employees enables us to study the strategic use of underfunded defined benefits pension plans in wage renegotiation.

In particular, the BTS data provides detailed information on aggregate wages and number of employees in different job categories which enable us to calculate the average wage in each of these job groups. These data are a major improvement over the wage data that is available in other data sets.[30] Rather than providing aggregate wages to all employees in a firm, the BTS data provides intra-firm information across employee group categories. This detailed group specific intra-firm information lies at the heart of our identification strategy.

A. Identification

As shown in the model in Section II, an airline is more likley to obtain concessions from labor when its financial condition is sufficeintly poor. Further, conditional on renegotiation occuring, the model shows that employee concessions will be larger when the underfunding of their pension plan is greater, as in these cases employees' outside option is lower. Finally, the model predicts that the effect of underfunding on wage concessions will be larger amongst plans where the PBGC pension coverage is lower. Based on these predictions, our identification stratgey can be divided into two.

We first show that airlines are more likely to obtain wage concessions when (1) the airline is financially constrained (measured by either having low cash flow or being in bankruptcy) and (2) when the pension plan is underfunded. To do so we interact the financial position of an airline with the funding status of the relevant pension plan to determine whether, in firms in financial distress, employees that are exposed to the risk of losing their pension benefits are more willing to make

[29]The benchmark annual guaranty used on this calculation is for a worker that retires at age 65. Table A1 provides detailed information on the PBGC maximum guaranty.

[30]In fact, even total wages is not always available in standard data sets. For example, in Compustat many firms do not report wages as a separate item and instead lump them with other expenses as part of Selling, General and Administration (SG&A).

concessions. This approach focuses the analysis at the pension plan level while using variation in firm financial distress and pension plan underfunding. In employing this approach we control for either firm or plan fixed effects to identify off of within airline or within plan variation. We thus exploit both the cross-sectional variation of plan underfunding within a given firm as well as the time-series variation in plan-level underfunding status.

Clearly, both an airline's financial position and pension plan underfunding are endogenous and likely to be jointly driven by such factors as airline profitability. However, by using an interaction term we can limit the number of alternative explanations that may drive our results. For example, an airline level financial shock cannot on its own explain differential wage concessions across different employee groups. In contrast, our mechanism is specifically based on different levels of wage concessions across employee groups associated with the degree of underfunding of their corresponding pension plans.

The next layer of our identification strategy exploits the maximum pension guaranty which is set exogenously by PBGC. While being responsible for paying monthly benefits to retirees of underfunded terminated pension plans, the PBGC guarantee is limited. The maximum annual guarantee is a function of age and hence is identical for employees of the same age regardless of their education, skill or wage.[31]

Figure 1 displays average wages for different airline employee groups relative to the PBGC maximum at different retirement ages. Given that the PBGC guarantee is set by law exogenously, we use the difference between current wages of different airline's employee groups and the PBGC maximum guarantee to measure the amount these employees stand to lose if the pension plan is terminated. Clearly, as this difference increases, employees stand to lose more from pension plan termination, making their bargaining position in wage renegotiation weaker. We therefore exploit the high dispersion in the difference between average wages and the PBGC limit across different job categories within an airline to identify the bargaining power of the airlines vis-a-vis different employee groups. As an example, the average wage of a pilot in our sample is about five times the PBGC limit for a 60 year old retiree, and the average mechanic wage is more than twice the PBGC limit for the same age. In contrast, the average wages of flight attendants and traffic and handling workers are higher than the PBGC limit by only 40% and 60%, respectively. Thus, to

[31]Table A1 reports the maximum annual amounts covered by the PBGC for workers retiring in the years 1992 to 2006 at the age of 50, 55, 60 and 65 years. Throughout our sample, the average maximum guaranty for a retiring 60-year-old worker is $24,224 while that for a 65-year-old is $37,268.

the extent that their pension plans are underfunded, pilots and mechanics will be at a weaker bargaining position than that of other job categories. Our approach is consistent with Brown's (2008) assertion that "[t]he maximum insurance benefit is set by law. While more than 90 percent of participants in plans taken over by the PBGC fall below this benefit limit, in some prominent cases, including those of some airline pilots, worker lose a substantial fraction of their promised retirement income."[32]

Econometrically, we identify the effect of pension underfunding on wage concessions using a triple-difference or DDD specification. These three levels of differences are: (i) financially distressed vs. non-distressed airlines, (ii) underfunded pension plans vs. funded plans, and (iii) wages exceeding vs. those that are below the PBGC limit.[33] In employing the DDD approach we also control for either firm or plan fixed effects to identify off of within airline or within plan variation.

VI. Wages, Financial Distress, and Underfunded Pensions

This section presents the results from regression analysis of wage renegotiation. We begin by testing the relation between firm financial distress, underfunded defined benefits pension plans, and wage negotiations by estimating different variants of the following baseline specification:

$$\begin{aligned} \%\Delta(wages/employees)_{a,i,t} &= \beta_1 \times low\ cash\ flow_{a,i,t} + \beta_2 \times underfunding_{a,i,t} \\ &+ \beta_{12} \times (low\ cash\ flow_{a,i,t} \times underfunding_{a,i,t}) \\ &+ \mathbf{b}_a\gamma + \mathbf{c}_i\delta + \mathbf{d}_t\theta + \mathbf{X_{a,t}}\lambda + \epsilon_{a,i,t}, \end{aligned} \quad (1)$$

where $\%\Delta(wages/employees)$ is the annual percent change in the average wage of an employee group within an airline for that year. Subscripts indicate airline (a), employee group (i), and year (t); $low\ cash\ flow$ is a dummy variable that equals one if an airline's earnings plus cash balance is smaller than its interest expenses and zero otherwise;[34] $underfunding$ is a dummy variable that equals one for underfunded pension plans; $\mathbf{b}_a$ is a vector of airline fixed-effects; $\mathbf{c}_i$ is a vector of employee group fixed-effects; $\mathbf{d}_t$ is a vector of year fixed-effects; $\mathbf{X_{a,i,t}}$ is a vector of airline controls that includes size (log book value of assets), leverage, the market-to-book ratio and the wage share

[32] Brown (2008) p. 184.

[33] This approach is common in applied microeconomics (see for example Gruber (1994)), and has became more popular recently in corporate finance applications as well as in Rauh (2006b).

[34] Our results are not sensitive to this definition, we obtain similar results if we define low cash flow as airlines with non-positive earnings, or as those airlines with profitability rates below the 33rd percentile.

of the employee category group as a fraction of total firm wage expenses; and $\epsilon_{a,i,t}$ is the regression residual.

We report the results from estimating different variants of regression 1 in the first three columns of Table 3. Tables throughout the paper report regressions coefficients and standard errors that are clustered at the airline level. Our main coefficient of interest is β_{12} – the coefficient of the interaction term. This coefficeint captures the joint effect of financial distress at the airline level and the underfunding of the pension plan of an employee group within the airline on wage concessions made by members of that employee group.

As the first three columns of Table 3 demonstrate, we find that β_{12} is consitenetly negative and statistically significant – distressed airlines obtain wage concessions from the employee groups whose pension plans are underfunded.[35] Our results hold after controlling for airline specific controls, year fixed effects and both airline and plan fixed effects.[36] The estimates of β_{12} are between -3.7% and -4.7%, suggesting that airlines obtain wage concessions that are around 4 percent of the annual average wage when both cash flow is low and the employee's pension plan is underfunded.

We repeat the analysis in regression (1), this time using bankruptcy as a measure of financial distress. To this end, we replace the $low\ cash\ flow$ dummy variable with a bankruptcy dummy variable that takes on the value of one when an airline is in Chapter-11 during a given year.[37] The results for the bankruptcy regressions are reported in the last three columns of Table 3. While we find that average wages decline by between 6.9% and 9.8% during bankruptcy years, the interaction between bankruptcy and underfunding is not statistically significant in any of the three regressions presented in the table. Our results potentially indicate that airlines tend to do most of the labor renegotiations before they file for Chapter-11. However, we revisit these results in our DDD specifications in the next section and find evidence that airlines strategically renegotiate wages in bankruptcy as well.

[35] While the coefficients of both low cash flow and underfunding are negative they are not statistically different from zero.

[36] Obviously we cannot control for both airline and plan fixed-effects at the same time as employee groups are defined at the airline level.

[37] None of the airlines in the sample filed for Chapter-7. The Chapter-11 bankruptcies in our sample include: Continental Airlines (1990-1993), Trans World Airways (1992-1993 and 1995), Hawaiian Airlines (1993-1994 and 2003-2005), US Airways (2002-2003 and 2004-2005), United Airlines (2002-2006), Delta Airlines (2005-2007) and Northwest Airlines (2005-2007).

VII. Wages, Pension Underfunding and the PBGC Maximum Guarantee

The results thus far show that wages are more likely to be negotiated downwards during periods of financial distress when defined benefits plans are underfunded. While the evidence is consistent with a strategic use of pension underfunding, it is also possible that pension underfunding merely reflects deep financial distress. According to this alternative view, the specific mechanism is not the threat of pension-dumping but rather the overall poor financial position of the firm. Thus, while our results indicate that two conditions are needed to facilitate wage concessions – both financial distress and pension underfunding – it is also possible to argue that, empirically, the interaction term is capturing a severe version of financial distress and does not necessarily indicate a causal effect of the threat to dump pensions.

A. Differences-in-Differences-in-Differences: Financially Constrained Airlines

To identify the causal effect of pension underfunding, we exploit the variation in the difference between airline employee salaries and the PBGC maximum annual guarantee. The strategic use of pension underfunding in wage renegotiation predicts that the finding that financial distress and pension underfunding are associated with wage concessions should be concentrated amongst employee groups whose pensions are not fully covered by the PBGC guarantee. Indeed, since employees belonging to these groups would stand to lose the most from pension plan termination, their outside option in wage renegotiation is lower. To test this prediction, we use the following triple interaction specification:

$$\begin{aligned}
\%\Delta(wages/employees)_{a,i,t} &= \beta_1 \times low\ cash\ flow_{a,i,t} + \beta_2 \times underfunding_{a,i,t} + \beta_3 \times PBGC_{a,i,t} \\
&+ \beta_{12} \times (low\ cash\ flow_{a,i,t} \times underfunding_{a,i,t}) \\
&+ \beta_{13} \times (low\ cash\ flow_{a,i,t} \times PBGC_{a,i,t}) \\
&+ \beta_{23} \times (underfunding_{a,i,t} \times PBGC_{a,i,t}) \\
&+ \beta_{123} \times (low\ cash\ flow_{a,i,t} \times underfunding_{a,i,t} \times PBGC_{a,i,t}) \\
&+ \mathbf{b}_a\gamma + \mathbf{c}_i\delta + \mathbf{d}_t\theta + \mathbf{X_{a,t}}\lambda + \epsilon_{a,i,t}, \qquad (2)
\end{aligned}$$

where $\%\Delta(wages/employees)$ is the annual percent change in the average per-employee wage of one of the employee groups within an airline for that year. Subscripts indicate airline (a), employee group (i), and year (t); $low\ cash\ flow$ is a dummy variable that equals one if airline's earnings plus cash balance is smaller than its interest expenses and zero otherwise; $underfunding$ is a dummy variable that equals one for underfunded pension plans and zero otherwise; PBGC is a dummy variable that equals to one if the average wage is larger than 1.5 times the PBGC annual maximum guarantee; $\mathbf{b}_a$ is a vector of airline fixed-effects; $\mathbf{c}_i$ is a vector of employee group fixed-effects; $\mathbf{d}_t$ is a vector of year fixed-effects; $\mathbf{X_{a,i,t}}$ is a vector of airline controls that includes size (log book value of assets), leverage ratio, the market-to-book ratio and the wage share of the employee category group as a fraction of total firm wage expenses; and $\epsilon_{a,i,t}$ is the regression residual. The main coefficient in the DDD specification is β_{123} which identifies the effect of underfunded pension plans, in financially distressed airlines, on the wages of employees that are not fully covered by the PBGC maximum guarantee.

As the first three columns of Table 4 show, the DDD estimator β_{123} is negative and statistically significant, ranging from -9.3% to -11.2%. Thus, consistent with strategic wage renegotiation, airlines in financial distress can succssefully negotiate down the wages of their employees whose pensions are underfunded and are not fully covered by the PBGC maximum guarantee. As before, our results are robust to the inclusion of year and either airline or plan fixed effects in addition to airline specific controls. In the last three columns of the table we refine the definition of the underfunding dummy to capture higher levels of underfunding. The DDD estimator is -9.2% when the pension plan is underfunded by at least 10%, while it is -11.4% and -7.6% when the pension plan is underfunded by at least 15% and 25%, respectively.

We supplement our analysis by regressing the change in average wages (instead of the percentage change) and report results in Panel A of Table 5. While all the regressions in Table 5 control for the same explanatory variables as in earlier regressions we do not report their coefficients for brevity. The DDD estimator β_{123} estimates the average amount (in $ thousands) that financially constrained airlines extract from employees whose average wage exceeds the PBGC limit when their pension plans are underfunded. As the first three columns of the table show, airlines can strategically use underfunded pensions to reduce the average wage of relatively highly paid employees who are not covered by the PBGC by an amount that is between $12,252 and $14,795 per year. Furthermore, as the fifth and six columns of Table 5 show, an underfunding level of at least 15% or 25% allows

airlines to cut the average wage of highly-paid employees by an annual amount of $16,983 and $17,360, respectively.

A.1 Robustness tests

Our empirical strategy is to study within firm wage renegotiation by using intra-airline data on wages, pension underfunding, and relative PBGC coverage. While our results are robust to the inclusion of both airline and year fixed effects, it is still possible that the variation in our regressions comes from changes in the degree of airline financial distress over time as opposed to pure within-airline cross-sectional variation in pension funding. We attempt to alleviate this concern by including airline*year fixed-effects in the regressions. Results are report in Table 6. The inclusion of airline*year fixed effects allows us to have a cleaner within-airline comparison of different employee groups. As the table shows, the DDD coefficient is negative and is similar to our previous results (-0.092 in Table 6 compared to -0.102 in Table 4). Given our sample size (476 plan-year observations), the inclusion of 137 fixed effects diminishes the statistical significance of the results. Nevertheless, in our main specification we find that β_{123} is equal to -0.092 and is statistically significant at the 5 percent level. When we consider underfunding of at least 10% we find that β_{123} equals -0.081 and is not statistically significant (standard error=0.054), while when underfunding is defined at the 15% level β_{123} equals -0.098 and is significant at the 6 percent level. Finally, as before we do not find significant results when deep-underfunding is calculated at an underfunding level of 25%.

One concern with the DDD identification strategy is that the triple interaction estimator is just picking-up those employee groups that account for a large share of an airline's wage expense and hence have larger margins to make concessions. For example, according to this alternate hypothesis, firms in financial distress can negotiate highly paid pilots' wages downwards not because of the fact that their pensions are not covered by the PBGC but simply because pilots have larger slack in which to make wage concessions.[38]

This concern is alleviated in two ways. First, throughout the paper in every regression we control for the ratio between the wage of an employee group and the overall wage expense of the firm. For example, we divide the aggregate wages of pilots by the total wage expenses of the airline.

[38]Note, though, that this alternate theory implicitly requires that the level of pilots' rents (as defined by the difference between pilot wages and their next best outside offer) be higher than that of other employee groups, as opposed to simply their wage level being higher than that of other groups.

We find that the results are always robust to the inclusion of this wage share variable. Second, this alternate hypothesis that highly paid employees have larger concession margins in reengotiation does not easilly explain the impact of pension plan *underfunding* on the ability of firms to extract wage concessions. In particular, if the results are explained by greater slack among highly paid employee groups rather than by strategic use of pensions in bargaining, pension plan underfunding should not play much of a role. This reasoning suggests the following placebo analysis to test the importance of underfunded pension plans in strategic renegotiation.

We collect data on airlines that do not have defined benefits pensions plans – mostly small regional airlines, with the exception of Southwest and JetBlue.[39] For each of these airlines, we define within-airline placebo employee groups using the same employee group classification used throughout our analysis above (pilots, mechanic etc.) We next run a set of double interaction regressions with the annual change in employee-group wages as the dependent variable. As the independent variables the regressoins include the low cash flow dummy variable, the PBGC-bsaed dummy variable (that takes on a avlue of one if the averag eannual wage of a given employee group is larger than 1.5 times the PBGC annual maximum guarantee), and the interaction between these two variabels. As further controls the regressions include year and either airline or plan fixed effects, as well as leverage, wage share, and both airline size and size-squared to adjust for a potential non-linear effect of airline size given that many of the airlines without defined benefits pension plans are small.[40] We run the regressions separately for airlines with pension plans deeply underfunded at levels greater than 10% or 15% (the treatment group) and airlines with no defined-benefits plans (placebo). As Table 7 shows, the coefficient of the interactions between the low cash flow dummy variable and the PBGC dummies are negative (between -0.062 and -0.102) and statistically significant in the specifications that include both airline and year fixed effects. In contrast, when we run the regression using the placebo group, the coefficient of the interaction term is positive and close to zero (either 0.02 or 0.028) and is not statistically significant. Had our results been driven by some employee groups making concessions for reasons that are unrelated to pension underfunding – for example, highly paid pilots having greater slack to make concessions – the interaction term should have been negative and significant in the placebo regressions as well.

As an additional robustness test we control for industry conditions in Table 8 and reestimate

[39]The minimum size of an airline in the BTS data is $20 million.

[40]We cannot control for market-to-book given that the vast majority of the smaller airlines are not publicly traded.

regression 2. We construct three aggregate measures of airline industry condition: (i) weighted-average market-to-book, (ii) average fuel cost, and (iii) industry average profitability. The Internet Appendix provides details on the construction of these variables. Since our measures of industry performance are based on pure time-series variation, we cannot include both year fixed-effects and industry controls jointly. As Table 8 demonstrates, the inclusion of industry controls (in lieu of year effects) improves the precision of the DDD estimates, which are now always statistically significant at the 1 percent level. The point estimates are similar to those documented earlier – underfunded pension plans of employee groups that are not fully covered by the PBGC enable distressed airlines to extract wage concessions that are between 9.7% and 11.4% of the annual average wage.

Finally, while we do not control for unionization levels directly, labor unions are important determinants of wage increases and collective bargaining negotiations (Lewis (1986)). While many of the studies in this field utilize cross-industry variation in unionization levels, our focus on one particular industry alleviates the concern about the differential effect of unionization rates on wage negotiations. Indeed, air transportation is among the most unionized industries – according to Hirsch and Macpherson's estimates, 45.1% of the employees in the air transportation employees were unionized in 2008. Moreover, by studying airlines with defined benefit pension plans, we focus mostly on the most unionized airlines within the airline industry.[41] Still, to confirm that unionization rates are high and persistent in our sample, we gather firm level information on airline unionization rates. Since firm level unionization rates are not widely available, we follow Eschuk (2001) and read the 10-K filings of all airlines in our sample.[42] Some airlines report the actual number of their employees that are unionized while others just state whether a large share of their employees are unionized or not. We report the direct share of the employees that are unionized whenever this information is available in the airline's 10-K. Otherwise, we use a dummy variable that equals one if the airline reports that a large number of its employees are unionized. As Table A2 in Appendix A demonstrates, most of the airlines in our sample – with the exception of Delta airlines and Fedex – are highly unionized. Furthermore, the level of unionization is very persistent and stays almost constant over time, so that by controlling for airline or plan fixed-effects we are fully absorbing any differential effect of unionization.

[41] For example, JetBlue, the prominent example of non-unionized airline has no defined benefits pension plan and hence is not included in our sample.

[42] Airline 10-Ks are available in Edgar online starting at 1995.

B. Differences-in-Differences-in-Differences: Airlines in Chapter-11

We now turn to analyze the effect of Chapter-11 on wage negotiations using the DDD approach. We repeat the analysis in regression (2) but replace the Low Cash Flow dummy variable (meant to capture poor financial condition) with a bankruptcy dummy variable, taking the value of one when an airline is in bankruptcy. Similar to our previous analysis, we estimate different specifications of the following baseline regression:

$$\begin{aligned}
\%\Delta(wages/employees)_{a,i,t} &= \beta_1 \times bankruptcy_{a,i,t} + \beta_2 \times underfunding_{a,i,t} + \beta_3 \times PBGC_{a,i,t} \\
&+ \beta_{12} \times (bankruptcy_{a,i,t} \times underfunding_{a,i,t}) \\
&+ \beta_{13} \times (bankruptcy_{a,i,t} \times PBGC_{a,i,t}) \\
&+ \beta_{23} \times (underfunding_{a,i,t} \times PBGC_{a,i,t}) \\
&+ \beta_{123} \times (bankruptcy_{a,i,t} \times underfunding_{a,i,t} \times PBGC_{a,i,t}) \\
&+ \mathbf{b}_a\gamma + \mathbf{c}_i\delta + \mathbf{d}_t\theta + \mathbf{X_{a,t}}\lambda + \epsilon_{a,i,t}, \qquad (3)
\end{aligned}$$

As before, we are interested in the DDD coefficient β_{123} which measures the joint effect of bankruptcy and underfunding on the wages of employees that are not fully covered by the PBGC maximum guarantee. We report the results from estimating regression (3) in Table 9. We find that β_{123} is negative and between -9.5% and -16.4% in all specifications. When we control for both year and airline fixed effects the DDD coefficient is -12.8% and is statistically significant at the 5 percent level. Further, we find that high levels of underfunding lead to deeper wage concessions in bankruptcy: underfunding of at least 15% of the plan level is associated with average wages that are 16.4% lower, while underfunding of at least 25% leads to a 14.8% decline in annual average wage. We also use the actual change in average wages (in $ thousands) instead of the percentage change as a dependent variable and report the results in Panel B of Table 5. The average amount (in $ thousands) that bankrupt airlines extract from employees whose average wage exceeds the PBGC limit when their pension plans are underfunded is between $12,778 and $22,621 per year. Finally, as in Table 8, we include three measures of industry conditions in lieu of year fixed effects in regression (3) and report the results in Table 10. Our results are robust to the inclusion of industry variables with airline fixed-effects, and β_{123} ranges between -11.7% and -13.0%.

VIII. Conclusion

In this paper we analyze both theoretically and empirically airlines' renegotiations of labor contracts. We provide a simple model showing that airlines' ability to strategically renegotiate wages decreases in the airline's financial position and increases in the amount of underfunding of its pension obligations. Furthermore, the sensitivity of post-renegotiation labor payoffs to pension underfunding is greatest amongst pension plans where the PBGC guarantee is relatively small compared to the pension obligations. Our empirical results indicate that, consistent with the model, airlines in poor financial position are able to renegotiate and reduce labor costs of those employees whose pension plans are underfunded. Furthermore, exploiting the exogenously given PBGC maximum guarantee we show that airlines extract larger concessions from employees with average salaries higher than the PBGC limit. Our evidence supports the view that firms use their financial position to negotiate with labor and use the threat of 'pension dumping' strategically to extract concessions from unionized labor.

Appendix A: Appendix Tables

Table A1
Maximum Annual Guarantees Given by PBGC

This table provides the maximum annual amount covered by the Pension Benefit Guaranty Corporation gives at different ages at the time of retiring.

	50 Years	55 Years	60 Years	65 Years
1992	$9,879	$12,702	$18,348	$28,227
1993	$10,238	$13,163	$19,013	$29,250
1994	$10,739	$13,807	$19,943	$30,682
1995	$10,810	$13,899	$20,076	$30,886
1996	$11,097	$14,267	$20,608	$31,705
1997	$11,598	$14,911	$21,539	$33,136
1998	$12,099	$15,556	$22,469	$34,568
1999	$12,815	$16,476	$23,769	$36,614
2000	$13,531	$17,397	$25,128	$38,659
2001	$14,247	$18,317	$26,458	$40,705
2002	$15,034	$19,330	$27,921	$42,955
2003	$15,392	$19,790	$28,585	$43,977
2004	$15,535	$19,974	$28,851	$44,386
2005	$15,965	$20,526	$29,649	$45,614
2006	$16,681	$21,447	$30,978	$47,659
Mean	$13,044	$16,771	$24,224	$37,268

Table A2
Labor Unionization

This table provides the percentage of labor that is unionized in each firm. For those firm-year observations in which there is no detailed information, a dummy variable is used which takes a value of 1 if the firm has three or more unions and 0 otherwise.

Airline	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Alaska Airlines	1	1	87%	88%	87%	86%	84%	84%	1	84%	83%
American Airlines	1	1	1	1	1	1	1	1	1	1	1
Continental Airlines	1	1	1	1	1	1	1	44%	1	42%	1
Delta Airlines	0	0	0	0	14%	16%	0	18%	18%	18%	18%
Federal Express	0	0	0	0	0	0	0	0	0	0	0
Hawaiian Airlines	1	1	1	1	1	1	1	1	1	1	85%
Midwest Express	0	0	0	0	0	1	1	1	33%	1	35%
Northwest Airlines	1	1	1	1	1	1	1	1	1	1	1
Trans World Airlines	1	1	1	1	1	1	-	-	-	-	-
United Airlines	1	1	1	1	1	1	1	1	1	78%	80%
United Parcel Services	1	1	1	1	1	60%	60%	64%	1	64%	1
US Airways	69%	68%	65%	84%	84%	85%	86%	83%	84%	84%	81%

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Table 1:
The Delta Airlines Case Study: Initial Situation and Negotiation Outcomes for Pilots and for Non-Pilots

This table provides descriptive statistics on wages and pensions of Pilots and Non-Pilots before and after the firms Bankruptcy (September 15, 2005). *Before Bankruptcy*: negotiations during 2003, 2004 and 2005 before bankruptcy. *After Bankruptcy*: negotiations during 2005 after bankruptcy and on 2006.

Panel A: Wage and Pension Plan Situation

	Pilots			**Non-Pilots**		
	2004	2005	2006	2004	2005	2006
Number of employees	6,786	6,181	5,706	50,772	46,050	39,856
Wages						
- Total Wages ($m)	$1,421	$961	$726	$2,525	$2,040	$1,705
- Average Wage ($)	$209,330	$155,532	$127,268	$49,735	$44,297	$42,778
- PBGC Maximum Guaranty ($)	$44,386	$45,614	$47,659	$44,386	$45,614	$47,659
- Wages share of job group	36.0%	32.0%	29.9%	64.0%	68.0%	70.1%
Plan underfunding						
- Underfunding ($m)	$1,194	$1,858	$2,172	$2,124	$2,728	$2,965
- Underfunding per employee ($)	$175,957	$300,530	$380,687	$41,834	$59,239	$74,393
- Underfunding as % of plan assets	40.8%	86.0%	124.6%	47.5%	59.2%	64.6%
- Funding ratio (Assets/Liabilities)	71.0%	53.8%	44.5%	67.8%	62.8%	60.8%

Panel B: Negotiation Outcomes

	Pilots	**Non-Pilots**
Before bankruptcy (Jan/03 - Sep/05)		
- Average wage cut	32.5%	10.0%
- Pension plan status	Frozen	As usual (no change)
After bankruptcy (Sep/05 - Dec/06)		
- Average wage cut	14.0%	7.5%
- Pension plan status	Terminated	Frozen

Table 2:
Summary Statistics

This table provides descriptive statistics for the variables used in the empirical analysis.

Panel A: Wage and Benefit Variables

	Mean	25th Percentile	Median	75th Percentile	Standard Deviation	Min	Max
Total number of employees	45,663	9,523	39,952	72,480	35,446	1,856	126,634
(wages/operating revenue)	24.1%	21.2%	24.9%	27.5%	5.4%	11.6%	36.8%
Wage Share (of job group)	39.0%	18.3%	29.8%	47.0%	27.1%	1.9%	100.0%
(wages/employees)							
- Total	$70,143	$36,864	$50,400	$106,634	$43,235	$12,877	$209,330
- Pilots	$125,203	$111,462	$128,100	$139,863	$27,529	$65,143	$209,330
- Flight Attendants	$34,210	$29,834	$34,184	$38,049	$6,629	$19,519	$49,576
- Mechanics and Maintenance	$58,731	$38,788	$50,152	$68,849	$28,476	$27,275	$173,504
- Traffic and Handling	$38,624	$31,560	$37,505	$42,277	$11,343	$24,130	$116,074
% change (wages/employees)							
- Total	3.8%	-2.2%	3.8%	8.8%	12.6%	-37.1%	67.3%
- Pilots	3.0%	-3.7%	3.4%	8.2%	11.3%	-37.1%	34.0%
- Flight Attendants	4.0%	-2.0%	2.5%	9.1%	13.0%	-30.7%	65.0%
- Mechanics and Maintenance	5.1%	-4.0%	3.3%	11.6%	18.8%	-53.6%	68.1%
- Traffic and Handling	1.3%	-4.8%	1.9%	6.7%	12.3%	-41.0%	59.0%

Panel B: Other Variables

	Mean	25th Percentile	Median	75th Percentile	Standard Deviation	Min	Max
Underfunding dummy	0.557	0.0	1.0	1.0	0.497	0.0	1.0
Underfunding>10% of plan assets	0.389	0.0	0.0	1.0	0.488	0.0	1.0
Underfunding>15% of plan assets	0.340	0.0	0.0	1.0	0.474	0.0	1.0
Underfunding>20% of plan assets	0.271	0.0	0.0	1.0	0.445	0.0	1.0
Underfunding>25% of plan assets	0.221	0.0	0.0	0.0	0.415	0.0	1.0
Size ($m)	$10,792	$4,189	$8,725	$17,815	$7,979	$160	$28,177
Market-to-Book	1.252	1.020	1.136	1.251	0.479	0.743	4.084
Leverage	0.562	0.468	0.587	0.656	0.163	0.025	0.983
Profitability	3.67%	-0.61%	5.24%	9.53%	8.35%	-24.64%	26.14%
Low Cash Flow dummy	0.296	0.0	0.0	1.0	0.457	0.0	1.0
Bankruptcy dummy	0.155	0.0	0.0	0.0	0.363	0.0	1.0
(Wage>PBGC) dummy	0.815	1.0	1.0	1.0	0.389	0.0	1.0
(Wage>1.5*PBGC) dummy	0.435	0.0	0.0	1.0	0.496	0.0	1.0
(Wage>2*PBGC) dummy	0.338	0.0	0.0	1.0	0.474	0.0	1.0

Table 3:
Wages and Underfunding

The dependent variable in all regressions is the relative change in (Wages/Employees). All regressions include an intercept (not reported). The regressions control for size (natural logarithm of of assets), leverage (defined as current liabilities+long term debt all over total assets), market-to-book (defined as the airline's market value of equity+book value of assets-book value of equity all divided by the book value of assets), wage share (defined as the ratio of the wage of an employee group to overall wage expenses), low cash flow dummy (an indicator variable that equals one if the airline's earnings+cash balances are smaller than its interest expenses), underfunding dummy (an indicator variable that equals one if underfunding is larger than zero), bankruptcy dummy (an indicator variables that takes the value of one in airline bankruptcy years). Bankruptcy regressions also control for profitability (return on assets). The regressions also include either an interaction term between the low cash flow and underfunding dummies or an interaction term between the bankruptcy and underfunding dummies. All regressions include year- and either airline or plan fixed-effects. Standard errors are calculated by clustering at the airline level.

Dependent Variable=	% change in wages/ employees	% change in wages/ employees	% change in wages/ employees	% change in wages/ employees	% change in wages/ employees	% change in wages/ employees
Ln(Assets)	-0.001	0.081 a	0.070 a	0.000	0.054 b	0.050 b
	(0.004)	(0.021)	(0.022)	(0.004)	(0.023)	(0.022)
Leverage	0.031	0.209 b	0.198 b	0.085	0.104	0.106
	(0.071)	(0.085)	(0.085)	(0.072)	(0.077)	(0.076)
Market-to-Book	0.006	-0.010	-0.019	0.022	0.039	0.030
	(0.013)	(0.027)	(0.024)	(0.015)	(0.027)	(0.029)
Wage Share	-0.021	-0.028	1.428 a	-0.029 c	-0.038 c	1.364 a
	(0.017)	(0.023)	(0.357)	(0.014)	(0.020)	(0.431)
Profitability				0.154	0.218 c	0.188
				(0.110)	(0.113)	(0.114)
Low Cash Flow	-0.014	-0.016	-0.020			
	(0.021)	(0.023)	(0.022)			
Underfunding	0.000	-0.009	-0.002	-0.006	-0.028 b	-0.019
	(0.010)	(0.011)	(0.017)	(0.011)	(0.012)	(0.016)
Low Cash Flow	-0.045 b	-0.047 a	-0.037 b			
×Underfunding	(0.016)	(0.012)	(0.015)			
Bankruptcy				-0.069 a	-0.098 b	-0.097 b
				(0.019)	(0.032)	(0.036)
Bankruptcy				-0.036	0.004	0.016
×Underfunding				(0.029)	(0.031)	(0.036)
Adjusted R^2	0.08	0.11	0.12	0.13	0.14	0.14
Fixed-Effects						
Year	Yes	Yes	Yes	Yes	Yes	Yes
Airline	No	Yes	No	No	Yes	No
Plan	No	No	Yes	No	No	Yes
# of airlines	12	12	12	12	12	12
# of plans	46	46	46	46	46	46
Observations	476	476	476	470	470	470

Table 4:
Wages Underfunding and PBGC Coverage

The dependent variable in all regressions is the relative change in (Wages/Employees). All regressions include an intercept (not reported). The regressions control for size (natural logarithm of of assets), leverage (defined as current liabilities+long term debt all over total assets), market-to-book (defined as the airline's market value of equity+book value of assets-book value of equity all divided by the book value of assets), wage share (defined as the ratio of the wage of an employee group to overall wage expenses), low cash flow dummy (an indicator variable that equals one if the airline's earnings+cash balances are smaller than its interest expenses), underfunding dummy (an indicator variable that equals one if underfunding is larger than zero (first 3 columns), 10% (column 4), 15% (column 5), and 25% (column 6)), Wage>PBGC dummy (an indicator variables that takes the value of one if wage is larger than 1.5×PBGC maximum guarantee.) The regressions also include interaction terms between the low cash flow, underfunding and the Wage>PBGC dummies and a triple interactions as well. All regressions include year- and either airline or plan fixed-effects. Standard errors are calculated by clustering at the airline level.

				undefunding>		
				10%	**15%**	**25%**
Dependent Variable=	% change in wages/ employees	% change in wages/ employees	% change in wages/ employees	% change in wages/ employees	% change in wages/ employees	% change in wages/ employees
Ln(Assets)	0.000	0.086 a	0.061 b	0.062 b	0.064 b	0.060 c
	(0.005)	(0.021)	(0.024)	(0.028)	(0.029)	(0.028)
Leverage	0.043	0.216 b	0.200 b	0.200 b	0.202 b	0.206 a
	(0.076)	(0.084)	(0.082)	(0.075)	(0.072)	(0.067)
Market-to-Book	0.004	-0.009	-0.014	-0.011	-0.008	-0.003
	(0.013)	(0.027)	(0.027)	(0.024)	(0.024)	(0.023)
Wage Share	-0.008	-0.012	1.106 a	1.152 a	1.143 a	1.169 a
	(0.021)	(0.028)	(0.322)	(0.322)	(0.330)	(0.341)
Low Cash Flow	-0.032	-0.035	-0.034	-0.034	-0.037	-0.019
	(0.026)	(0.026)	(0.022)	(0.026)	(0.030)	(0.026)
Underfunding	-0.013	-0.028	-0.029	-0.006	-0.001	-0.017
	(0.018)	(0.022)	(0.024)	(0.021)	(0.026)	(0.020)
Wage>PBGC	0.009	0.009	0.120 a	0.129 a	0.131 a	0.137 a
	(0.017)	(0.012)	(0.034)	(0.039)	(0.041)	(0.042)
Low Cash Flow	-0.008	-0.003	0.010	0.012	0.018	-0.021
×Underfunding	(0.021)	(0.017)	(0.020)	(0.026)	(0.032)	(0.026)
(Wage>PBGC)	0.036	0.049	0.042	0.029	0.025	0.026
×Underfunding	(0.025)	(0.028)	(0.025)	(0.027)	(0.025)	(0.031)
Low Cash Flow	0.052	0.053	0.056 c	0.029	0.037	0.006
×(Wage>PBGC)	(0.030)	(0.032)	(0.031)	(0.034)	(0.034)	(0.040)
Low Cash Flow	-0.093 b	-0.102 a	-0.112 a	-0.092 c	-0.114 b	-0.076 b
×Underfunding	(0.030)	(0.025)	(0.024)	(0.048)	(0.041)	(0.034)
×(Wage>PBGC)						
Adjusted R^2	0.09	0.12	0.17	0.17	0.17	0.17
Fixed-Effects						
Year	Yes	Yes	Yes	Yes	Yes	Yes
Airline	No	Yes	No	No	No	No
Plan	No	No	Yes	Yes	Yes	Yes
# of airlines	12	12	12	12	12	12
# of plans	46	46	46	46	46	46
Observations	476	476	476	476	476	476

Table 5:
Actual Wage Concessions ($ Change)

The dependent variable in all regressions is the dollar change in (Wages/Employees) in $. All regressions include an intercept (not reported) and all the relevant control variables and fixed effects. Standard errors are calculated by clustering at the airline level.

Panel A: Wages Underfunding and PBGC Coverage ($ Change)

				undefunding>		
				10%	**15%**	**25%**
Dependent Variable=	$ change in wages/ employees	$ change in wages/ employees	$ change in wages/ employees	$ change in wages/ employees	$ change in wages/ employees	$ change in wages/ employees
Low Cash Flow ×Underfunding ×(Wage>PBGC)	-$12,252 a ($2,874)	-$12,975 a ($2,847)	-$14,795 a ($3,100)	-$13,039 a ($3,872)	-$16,983 b ($6,143)	-$17,360 b ($7,078)
Adjusted R^2	0.14	0.16	0.19	0.18	0.20	0.21
# of airlines	12	12	12	12	12	12
# of plans	46	46	46	46	46	46
Observations	476	476	476	476	476	476

Panel B: Wages, Underfunding, Bankruptcy and PBGC Coverage ($ Change)

				undefunding>		
				10%	**15%**	**25%**
Dependent Variable=	$ change in wages/ employees	$ change in wages/ employees	$ change in wages/ employees	$ change in wages/ employees	$ change in wages/ employees	$ change in wages/ employees
Bankruptcy ×Underfunding ×(Wage>PBGC)	-$12,778 a ($7,395)	-$14,372 a ($7,073)	-$13,549 a ($7,707)	-$13,028 a ($7,246)	-$22,621 b ($11,461)	-$22,552 b ($13,011)
Adjusted R^2	0.19	0.20	0.21	0.21	0.24	0.24
# of airlines	12	12	12	12	12	12
# of plans	46	46	46	46	46	46
Observations	470	470	470	470	470	470
Fixed-Effects						
Year	Yes	Yes	Yes	Yes	Yes	Yes
Airline	No	Yes	No	No	No	No
Plan	No	No	Yes	Yes	Yes	Yes

Table 6:
Wages, Underfunding and PBGC Coverage
(controlling for airline-year fixed effects)

The dependent variable in all regressions is the relative change in (Wages/Employees). All regressions include an intercept (not reported). The regressions control for size (natural logarithm of of assets), leverage (defined as current liabilities+long term debt all over total assets), market-to-book (defined as the airline's market value of equity+book value of assets-book value of equity all divided by the book value of assets), wage share (defined as the ratio of the wage of an employee group to overall wage expenses), low cash flow dummy (an indicator variable that equals one if the airline's earnings+cash balances are smaller than its interest expenses), underfunding dummy (an indicator variable that equals one if underfunding is larger than zero (column 1), 10% (column 2), 15% (column 3), and 25% (column 4)), Wage>PBGC dummy (an indicator variables that takes the value of one if wage is larger than 1.5×PBGC maximum guarantee.) The regressions also include interaction terms between the low cash flow, underfunding and the Wage>PBGC dummies and a triple interactions as well. All regressions include year*airline fixed-effects. Standard errors are calculated by clustering at the airline level.

		undefunding>		
		10%	**15%**	**25%**
Dependent Variable=	% change in wages/ employees	% change in wages/ employees	% change in wages/ employees	% change in wages/ employees
Ln(Assets)	-0.020 b	-0.019 c	-0.021 b	-0.019 a
	(0.008)	(0.009)	(0.007)	(0.006)
Leverage	0.118 b	0.124 b	0.125 a	0.131 a
	(0.040)	(0.041)	(0.039)	(0.026)
Market-to-Book	0.034 a	0.033 a	0.033 a	0.032 a
	(0.005)	(0.003)	(0.003)	(0.003)
Wages Share	-0.008	0.000	0.002	0.003
	(0.025)	(0.023)	(0.021)	(0.021)
Low Cash Flow	-0.079 a	-0.073 c	-0.080 b	-0.091 b
	(0.024)	(0.037)	(0.034)	(0.031)
Underfunding	-0.045	-0.049	-0.038	-0.044 b
	(0.028)	(0.033)	(0.031)	(0.015)
Wage>PBGC	-0.002	0.013	0.018	0.020
	(0.014)	(0.012)	(0.013)	(0.014)
Low Cash Flow	0.035	0.041	0.058	0.057
×Underfunding	(0.024)	(0.043)	(0.050)	(0.034)
(Wage>PBGC)	0.052	0.038	0.030	0.036
×Underfunding	(0.034)	(0.039)	(0.031)	(0.044)
Low Cash Flow	0.044	0.027	0.036	0.002
×(Wage>PBGC)	(0.031)	(0.030)	(0.035)	(0.036)
Low Cash Flow	-0.092 b	-0.081	-0.098 c	-0.047
×Underfunding	(0.039)	(0.054)	(0.047)	(0.057)
×(Wage>PBGC)				
Adjusted R^2	0.22	0.22	0.22	0.21
Fixed-Effects				
Airline*Year	Yes	Yes	Yes	Yes
# of airlines	12	12	12	12
# of airline*year	137	137	137	137
# of plans	46	46	46	46
Observations	476	476	476	476

Table 7:
Cash Flow and High Wages: Placebo Test

The dependent variable in all regressions is the relative change in (Wages/Employees). All regressions include an intercept (not reported). The regressions control for size (natural logarithm of of assets) and size squared, leverage (defined as current liabilities+long term debt all over total assets), wage share (defined as the ratio of the wage of an employee group to overall wage expenses), low cash flow dummy (an indicator variable that equals one if the airline's earnings+cash balances are smaller than its interest expenses), Wage>PBGC dummy (an indicator variables that takes the value of one if wage is larger than 1.5×PBGC maximum guarantee.) The regressions also include an interaction term between the low cash flow and the Wage>PBGC dummies. All regressions include year- and either airline or plan fixed-effects. Columns 1 and 2 consider only airlines with defined benefits plans that are underfunded by at least 10%, . Columns 3 and 4 consider only airlines with defined benefits plans that are underfunded by at least 15%. Columns 5 and 6 consider airlines without defined benefits plans. Standard errors are calculated by clustering at the airline level.

	DB airlines Underfunding>10%		**DB airlines Underfunding>15%**		**Non-DB Plan airlines**	
Dependent Variable=	% change in wages/ employees	% change in wages/ employees	% change in wages/ employees	% change in wages/ employees	% change in wages/ employees	% change in wages/ employees
Ln(Assets)	-0.306	-0.542	-0.405	-0.366	-0.014	-0.012
	(0.378)	(0.367)	(0.364)	(0.334)	(0.055)	(0.059)
Ln(Assets) Squared	0.024	0.039 c	0.029	0.028	0.001	0.002
	(0.021)	(0.021)	(0.021)	(0.020)	(0.005)	(0.006)
Leverage	0.175	0.101	0.219	0.179	0.024	0.032
	(0.180)	(0.205)	(0.214)	(0.212)	(0.050)	(0.050)
Wage Share	-0.028	1.487 b	-0.025	1.518 c	0.152 b	0.534 a
	(0.053)	(0.571)	(0.063)	(0.705)	(0.065)	(0.117)
Low Cash Flow	-0.040	-0.032	-0.029	-0.048	0.022	0.024
	(0.028)	(0.041)	(0.025)	(0.038)	(0.046)	(0.049)
Wage>PBGC	0.082 a	0.226 c	0.095 a	0.222 b	0.194 a	0.289 a
	(0.021)	(0.122)	(0.024)	(0.077)	(0.049)	(0.051)
Low Cash Flow	-0.071 c	-0.079	-0.102 a	-0.062	0.028	0.002
×(Wage>PBGC)	(0.033)	(0.053)	(0.029)	(0.047)	(0.073)	(0.076)
Adjusted R^2	0.03	0.11	0.06	0.12	0.08	0.07
Fixed-Effects						
Year	Yes	Yes	Yes	Yes	Yes	Yes
Airline	Yes	No	Yes	No	Yes	No
Plan	No	Yes	No	Yes	No	Yes
# of airlines	12	12	12	12	50	50
# of job groups	33	33	33	33	100	100
Observations	183	183	159	159	666	666

Table 8:
Wages Underfunding and PBGC Coverage (Including Industry Controls)

The dependent variable in all regressions is the relative change in (Wages/Employees). All regressions include an intercept (not reported). The regressions control for size (natural logarithm of of assets), leverage (defined as current liabilities+long term debt all over total assets), market-to-book (defined as the airline's market value of equity+book value of assets-book value of equity all divided by the book value of assets), wage share (defined as the ratio of the wage of an employee group to overall wage expenses), low cash flow dummy (an indicator variable that equals one if the airline's earnings+cash balances are smaller than its interest expenses), underfunding dummy (an indicator variable that equals one if underfunding is larger than zero), Wage>PBGC dummy (an indicator variables that takes the value of one if wage is larger than 1.5×PBGC maximum guarantee.) The regressions also include interaction terms between the low cash flow, underfunding and the Wage>PBGC dummies and a triple interactions as well. Regression include time-varying industry conditions (industry control) and either airline or plan fixed-effects. Standard errors are calculated by clustering at the airline level.

			Industry Control			
	M-to-B (12 airlines)		**Avg. Fuel Cost**		**Profitability**	
Dependent Variable=	% change in wages/ employees	% change in wages/ employees	% change in wages/ employees	% change in wages/ employees	% change in wages/ employees	% change in wages/ employees
Ln(Assets)	0.038	0.025	0.023	0.011	-0.003	-0.012
	(0.031)	(0.029)	(0.026)	(0.025)	(0.024)	(0.019)
Leverage	0.205 a	0.200 a	0.205 b	0.199 a	0.181 b	0.173 b
	(0.057)	(0.048)	(0.070)	(0.060)	(0.077)	(0.066)
Market-to-Book	-0.029	-0.033	-0.038	-0.044 c	-0.061 b	-0.064 b
	(0.032)	(0.025)	(0.027)	(0.023)	(0.026)	(0.021)
Wage Share	-0.007	1.129 a	-0.008	1.074 a	-0.009	1.068 a
	(0.027)	(0.303)	(0.027)	(0.291)	(0.024)	(0.287)
Industry Control	-0.148 c	-0.135 c	-0.051	-0.043	0.104	0.009
	(0.068)	(0.063)	(0.030)	(0.028)	(0.182)	(0.173)
Low Cash Flow	-0.045 b	-0.042 b	-0.029	-0.026	-0.026	-0.026
	(0.018)	(0.017)	(0.024)	(0.021)	(0.032)	(0.029)
Underfunding	-0.027 c	-0.025	-0.028	-0.027	-0.033 b	-0.036 c
	(0.015)	(0.017)	(0.016)	(0.018)	(0.015)	(0.018)
Wage>PBGC	0.009	0.122 a	0.007	0.124 a	0.005	0.123 a
	(0.014)	(0.033)	(0.013)	(0.034)	(0.014)	(0.031)
Low Cash Flow	-0.004	0.010	-0.018	-0.004	-0.016	-0.002
×Underfunding	(0.014)	(0.016)	(0.019)	(0.020)	(0.019)	(0.020)
(Wage>PBGC)	0.046	0.040 c	0.050 c	0.045 c	0.053 b	0.050 b
×Underfunding	(0.026)	(0.021)	(0.027)	(0.021)	(0.024)	(0.020)
Low Cash Flow	0.058 c	0.063 c	0.051 c	0.056	0.055 c	0.060 c
×(Wage>PBGC)	(0.031)	(0.034)	(0.028)	(0.032)	(0.028)	(0.031)
Low Cash Flow	-0.100 a	-0.114 a	-0.097 a	-0.111 a	-0.104 a	-0.118 a
×Underfunding	(0.019)	(0.021)	(0.019)	(0.020)	(0.019)	(0.021)
×(Wage>PBGC)						
Adjusted R^2	0.09	0.15	0.08	0.14	0.07	0.13
Fixed-Effects						
Year	No	No	No	No	No	No
Airline	Yes	No	Yes	No	Yes	No
Plan	No	Yes	No	Yes	No	Yes
# of airlines	12	12	12	12	12	12
# of plans	46	46	46	46	46	46
Observations	476	476	476	476	476	476

Table 9:
Wages, Underfunding, Bankruptcy and PBGC Coverage

The dependent variable in all regressions is the relative change in (Wages/Employees). All regressions include an intercept (not reported). The regressions control for size (natural logarithm of of assets), leverage (defined as current liabilities+long term debt all over total assets), market-to-book (defined as the airline's market value of equity+book value of assets-book value of equity all divided by the book value of assets), wage share (defined as the ratio of the wage of an employee group to overall wage expenses), profitability (return on assets), bankruptcy dummy (an indicator variables that takes the value of one in airline bankruptcy years), underfunding dummy (an indicator variable that equals one if underfunding is larger than zero (columns 1-3), 10% (column 4), 15% (column 5), and 25% (column 6)), Wage>PBGC dummy (an indicator variables that takes the value of one if wage is larger than 1.5×PBGC maximum guarantee.) The regressions also include interaction terms between the bankruptcy, underfunding and the Wage>PBGC dummies and a triple interactions as well. All regressions include year- and either airline or plan fixed-effects. Standard errors are calculated by clustering at the airline level.

				undefunding>		
				10%	**15%**	**25%**
Dependent Variable=	% change in wages/ employees	% change in wages/ employees	% change in wages/ employees	% change in wages/ employees	% change in wages/ employees	% change in wages/ employees
Ln(Assets)	0.000	0.058 b	0.045 c	0.045 c	0.039 c	0.043
	(0.005)	(0.022)	(0.021)	(0.023)	(0.022)	(0.024)
Leverage	0.097	0.109	0.123	0.130	0.118	0.123
	(0.076)	(0.075)	(0.078)	(0.074)	(0.070)	(0.071)
Market-to-Book	0.018	0.043	0.031	0.027	0.026	0.028
	(0.015)	(0.027)	(0.031)	(0.029)	(0.029)	(0.027)
Wage Share	-0.017	-0.022	1.064 b	1.096 b	1.076 a	1.074 a
	(0.017)	(0.023)	(0.384)	(0.370)	(0.341)	(0.341)
Profitability	0.164	0.213 c	0.185	0.162	0.143	0.152
	(0.108)	(0.111)	(0.110)	(0.117)	(0.100)	(0.099)
Bankruptcy	-0.088 a	-0.138 a	-0.113 b	-0.113 b	-0.093 c	-0.082
	(0.009)	(0.027)	(0.045)	(0.037)	(0.044)	(0.053)
Underfunding	-0.014	-0.045 c	-0.041	-0.019	-0.006	-0.030 c
	(0.020)	(0.025)	(0.025)	(0.016)	(0.024)	(0.014)
Wage>PBGC	0.015	0.013	0.123 a	0.131 a	0.132 a	0.134 b
	(0.014)	(0.014)	(0.037)	(0.038)	(0.042)	(0.045)
Bankruptcy	0.003	0.068 b	0.060	0.071 a	0.044	0.044
×Underfunding	(0.031)	(0.031)	(0.043)	(0.022)	(0.027)	(0.044)
(Wage>PBGC)	0.023	0.040	0.032	0.020	0.016	0.034
×Underfunding	(0.027)	(0.033)	(0.033)	(0.027)	(0.022)	(0.033)
Bankruptcy	0.048	0.075 c	0.069 b	0.048	0.082 b	0.056 b
×(Wage>PBGC)	(0.032)	(0.035)	(0.028)	(0.027)	(0.031)	(0.023)
Bankruptcy	-0.095	-0.128 b	-0.115 c	-0.100 c	-0.164 b	-0.148 c
×Underfunding	(0.058)	(0.054)	(0.063)	(0.051)	(0.059)	(0.068)
×(Wage>PBGC)						
Adjusted R^2	0.13	0.15	0.19	0.19	0.19	0.19
Fixed-Effects						
Year	Yes	Yes	Yes	Yes	Yes	Yes
Airline	No	Yes	No	No	No	No
Plan	No	No	Yes	Yes	Yes	Yes
# of airlines	12	12	12	12	12	12
# of plans	46	46	46	46	46	46
Observations	470	470	470	470	470	470

Table 10:
Wages, Underfunding, Bankruptcy and PBGC Coverage (Including Industry Controls)

The dependent variable in all regressions is the relative change in (Wages/Employees). All regressions include an intercept (not reported). The regressions control for size (natural logarithm of of assets), leverage (defined as current liabilities+long term debt all over total assets), market-to-book (defined as the airline's market value of equity+book value of assets-book value of equity all divided by the book value of assets), wage share (defined as the ratio of the wage of an employee group to overall wage expenses), profitability (return on assets), bankruptcy dummy (an indicator variables that takes the value of one in airline bankruptcy years), underfunding dummy (an indicator variable that equals one if underfunding is larger than zero (columns 1-3), 10% (column 4), 15% (column 5), and 25% (column 6)), Wage>PBGC dummy (an indicator variables that takes the value of one if wage is larger than 1.5×PBGC maximum guarantee.) The regressions also include interaction terms between the bankruptcy, underfunding and the Wage>PBGC dummies and a triple interactions as well. Regression include time-varying industry conditions (industry control) and either airline or plan fixed-effects. Standard errors are calculated by clustering at the airline level. Standard errors are calculated by clustering at the airline level.

			Industry Control			
	M-to-B (12 Firms)		**Avg. Fuel Cost**		**Profitability**	
Dependent Variable=	% change in wages/ employees	% change in wages/ employees	% change in wages/ employees	% change in wages/ employees	% change in wages/ employees	% change in wages/ employees
Ln(Assets)	0.037	0.026	0.017	0.005	0.007	-0.007
	(0.030)	(0.028)	(0.025)	(0.025)	(0.022)	(0.019)
Leverage	0.169 b	0.174 b	0.143 b	0.148 b	0.115 c	0.116 c
	(0.060)	(0.060)	(0.062)	(0.061)	(0.059)	(0.061)
Market-to-Book	0.013	-0.001	0.006	-0.010	0.004	-0.014
	(0.024)	(0.021)	(0.023)	(0.022)	(0.027)	(0.028)
Profitability	0.153	0.135	0.081	0.056	0.100	0.080
	(0.104)	(0.108)	(0.098)	(0.102)	(0.104)	(0.109)
Wage Share	-0.015	1.080 a	-0.016	1.048 b	-0.017	1.026 b
	(0.025)	(0.350)	(0.025)	(0.352)	(0.024)	(0.351)
Industry Control	-0.103 c	-0.119 c	-0.016	-0.023	-0.146	-0.167
	(0.048)	(0.054)	(0.025)	(0.023)	(0.161)	(0.166)
Bankruptcy	-0.135 a	-0.106 b	-0.143 a	-0.110 a	-0.154 a	-0.122 a
	(0.017)	(0.036)	(0.016)	(0.032)	(0.014)	(0.034)
Underfunding	-0.028	-0.019	-0.031	-0.023	-0.036 c	-0.032
	(0.020)	(0.019)	(0.021)	(0.021)	(0.020)	(0.021)
Wage>PBGC	0.014	0.123 a	0.011	0.121 a	0.009	0.120 a
	(0.012)	(0.036)	(0.013)	(0.035)	(0.011)	(0.034)
Bankruptcy	0.062 b	0.051	0.055 b	0.041	0.055 c	0.039
×Underfunding	(0.025)	(0.036)	(0.024)	(0.036)	(0.027)	(0.040)
(Wage>PBGC)	0.039	0.027	0.043	0.032	0.047	0.038
×Underfunding	(0.030)	(0.030)	(0.031)	(0.031)	(0.029)	(0.030)
Bankruptcy	0.074 c	0.055 c	0.074	0.052	0.077 c	0.057 c
×(Wage>PBGC)	(0.040)	(0.026)	(0.043)	(0.030)	(0.042)	(0.028)
Bankruptcy	-0.117 b	-0.089	-0.123 b	-0.093	-0.130 b	-0.102
×Underfunding	(0.045)	(0.050)	(0.054)	(0.060)	(0.051)	(0.061)
×(Wage>PBGC)						
Adjusted R^2	0.13	0.17	0.12	0.16	0.12	0.16
Fixed-Effects						
Year	No	No	No	No	No	No
Airline	Yes	No	Yes	No	Yes	No
Plan	No	Yes	No	Yes	No	Yes
# of airlines	12	12	12	12	12	12
# of plans	46	46	46	46	46	46
Observations	470	470	470	470	470	470