

Negotiating with Labor under Financial Distress*

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10 We analyze how firms renegotiate labor contracts to extract concessions from labor. While anecdotal evidence suggests that firms tend to renegotiate wages downward in times of financial distress, there is no empirical evidence that documents such renegotiation, its determinants, and its magnitude. This article attempts to fill this gap. Using a unique data set of airlines, which includes detailed information on wages and pension plans, we document an empirical link between airline financial distress, 15 pension underfunding, and wage concessions. (*JEL* G23, G33, J31, J33, L93)

The setting of wages and their renegotiation are crucial in determining labor outcomes. At the individual-firm level, wages determine the division of surplus between shareholders and employees while, economy-wide, wages determine the supply of and demand for labor. In this article, we 20 analyze the role finance plays in renegotiations of labor contracts. While anecdotal evidence suggests that firms tend to renegotiate wages downward in times of financial distress, there is no empirical evidence that

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documents such renegotiation, its determinants, and its magnitude. This article attempts to fill this gap. Using a unique data set of airlines, which 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 has made important contributions in understanding the interaction between finance and labor (Klasa, Maxwell, and Ortiz-Molina 2009; Matsa 2010; Benmelech, Bergman, and Seru 2011). Our article adds to this literature by focusing 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 firms threaten to default on their pension obligations during wage renegotiation and thereby renege on the promise of future retirement benefits to workers.¹

We first show that airlines in financial distress obtain wage concessions from employees whose pension plans are underfunded in that 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. As part of our identification strategy, we then exploit the fact that pension plans in the United States are partially insured by the Pension Benefit Guaranty Corporation (PBGC)—a federal corporation that protects the pensions of nearly forty-four million American workers. While most defined benefit pensions in the United States are insured by the PBGC, this coverage is limited. The maximum annual guarantee is determined by employee age and was \$30,978 for a sixty-year-old employee in 2006. Since high-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 (DDD) specification, with three levels of differences: (1) financially distressed versus non-distressed airlines; (2) underfunded pension plans versus funded plans; and (3) wages exceeding versus those that are below the PBGC limit. Consistent with our hypothesis, we find that airlines that are financially distressed can renegotiate the wages of their employees whose pensions are underfunded and are not fully covered by the PBGC guarantee. The magnitude of the DDD estimator suggests that such airlines can renegotiate annual wages downward by between 9.3% and 11.2%, as compared with their peers. Since wages are generally downward rigid

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

(see, e.g., [Bewley 2000](#)), our results point to the importance of financial distress and reduced employee outside options in management's ability to elicit concessions from labor. 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 expense and hence have larger margins to make concessions. For example, in accordance with this alternate hypothesis, firms in financial distress can negotiate high-paid pilots' wages downward—not because the pilots' pensions are not covered by the PBGC and hence their bargaining position is weaker—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 firm 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 wage renegotiation in airlines with deeply underfunded plans (the treatment group) to wage renegotiation in similar employee groups in airlines with no defined benefit plans (the placebo group). We find that among high-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, identically high-paid employee groups employed in airlines without defined benefit plans do not accept wage cuts in renegotiation. Thus, our results are not likely driven by simply some employee groups that make wage concessions for reasons unrelated to pension underfunding.

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](#); [Dasgupta and Sengupta 1993](#); [Perotti and Spier 1993](#)). Similarly, using firm-level data, [Hanka \(1998\)](#) finds that debt is negatively correlated with wages, employment, and pension funding. Furthermore, [Hirsch \(1991\)](#) and [Cavanaugh and Garen \(1997\)](#) find evidence that leverage is positively correlated with unionization rates. While the articles make important empirical contributions, the results reported in these articles may be driven by an omitted-variables bias in which industries with higher unionization rates also have higher debt capacity for reasons unrelated to

management-labor bargaining. This concern has been alleviated recently by Matsa (2010). He shows using exogenous variation in state-level labor laws, that when states adopt legislation that reduces union bargaining power, firms with concentrated labor markets reduce debt relative to otherwise similar firms in other states.² Consistent with Matsa's results, Klasa, Maxwell, and Ortiz-Molina (2009) provide strong evidence that firms in more unionized industries hold less cash. 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 to support the role that financial distress plays in actual ex post wage renegotiations. Our article adds to this literature by analyzing renegotiations ex post and identifying the conditions under which firms can successfully use their financial position to extract surplus from labor. In particular, our article is the first to provide micro-evidence on within-firm wage renegotiations and their relation to financial distress and pension underfunding.

Our article is also 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.³ More broadly, our article adds to the growing body of empirical literature on the role that labor plays in finance (see Agrawal 2008; Atanassov and Kim 2009; Bertrand 2004; Chen, Kacperczyk, and Ortiz-Molina 2009, 2011; Rosett 1990). Finally, our article is also related to the literature that examines the relation between leverage and product market prices (see, e.g., Chevalier 1995). Rather than examining product market prices, our study relates financial performance to an important input price, namely, wages.

The rest of the article is organized as follows. Section 1 analyzes a simple contract-renegotiation model that is based on Hart and Moore (1994). Our model generates three intuitive predictions that are then tested in the data. Section 2 provides a case study that analyzes 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 3 provides a description of our data sources and summary statistics. We detail our identification strategy in

² In contrast, a recent paper by Simintzi, Vig, and Volpin (2009) provides international empirical evidence that increases in labor protection are associated with decreases in leverage.

³ Another related paper is Petersen (1992), which shows that firms decide to terminate *over-funded* pension plans in order to transfer wealth from employees to shareholders.

Section 4. Sections 5 and 6 describe the empirical analysis. Section 7 concludes.

1. The Model

This section develops a simple model that analyzes 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 crucial component of our analysis is the role of the PBGC—a federal corporation that protects the pensions of nearly forty-four million American workers. While most defined benefit pensions in the United States are insured by the PBGC, coverage is limited. The maximum annual guarantee is set by Congress and is determined by employee age—in 2006, e.g., the maximal annual guarantee for a sixty-year-old employee was \$30,978. In accordance with 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.⁴ 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 that the plan administrator should 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, the PBGC takes over the plan as a trustee and transfers all of the plan's assets to itself. 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

⁴ 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.

transfer the guaranteed portion of the pension for life to each plan beneficiary.⁵

1.1 Setup

5 Consider a firm that is run by management that represents shareholders and employs labor to generate earnings. The model comprises 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 a cash flow of C_2 . To approximate the situation faced by large publicly traded firms in
10 the United States, all cash flows are assumed to be nonexpropriable.

Prior to period 1, workers and management are assumed to have signed a contract, which stipulates 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 takes it as exogenous.⁶ For
15 simplicity, we assume that $C_2 > W$, so 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
20 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 that the firms are required to make mandatory contributions to pension plans, we assume that if labor's pension plan is underfunded in period 1, then in period 2, after having paid
25 W in wages, the firm must use the remaining cash balances to fully fund the pension.⁷ The level of funding at period 2 is then equal to $\min[C_1 + C_2 - W + F, P]$.

To model the PBGC, we assume that the government guarantees labor's pension up to an amount of G .⁸ 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
30

⁵ Even when a plan is trustee by the PBGC, there are workers that have accrued pension benefits that are smaller than the PBGC guarantee. These workers receive their accrued benefits from the PBGC. The beneficiaries that actually obtain the maximum guarantee are those with accrued benefits larger than or equal to the relevant PBGC guarantee.

⁶ 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).

⁷ Firms are required to make contributions to their defined benefit pension plans by the Employee Retirement Income Security Act of 1974. See Rauh (2006a) for an analysis of the consequences of mandatory contributions for a firm's investment policies.

⁸ See Brown (2008) for a detailed description and account of the PBGC.

that the pension plan is first funded by the firm's available cash and only then funded by the government guarantee.⁹ 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.

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.¹⁰ 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 previously described. To the extent that the pension plan is not fully repaid, the PBGC provides its pension guarantee up to an amount G , as previously described. 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 the human capital that 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.¹¹ Thus, in attempting to renegotiate the labor contract, management is in essence threatening labor with the firm's demise, and the inability of the firm to pay wages and pension benefits. Labor's 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 .¹²

⁹ This follows the mandate of the Employee Retirement Income Security Act of 1974.

¹⁰ While the model could be extended to allow workers to initiate renegotiation as well, our focus is on management-triggered renegotiation. Allowing for employee-triggered renegotiation complicates the exposition while providing relatively few additional insights. Further, as will be explained, our identification strategy relies on employing the PBGC pension guarantee in such a way that the relevant type of renegotiation we analyze is that meant to *lower* the firm's labor expenses, i.e., management triggered.

¹¹ 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 correspond 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).

¹² 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.

1.2 Contract renegotiation, pension underfunding, and pension guarantees

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

5 1. $P \leq C_1 + F$

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
 10 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
 15 to abide by the contract since labor obtains a relatively high fraction of the continuation rents. More 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,
 20 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 .

25

2. $C_1 + F < P$

In this region, the period 1 assets of the firm are not sufficient to cover the firm's pension obligations. This has two implications: 1) in renegotiation, management's outside option is zero; and 2) since the pension
 30 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, i.e., 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.

35 2a. $G \leq C_1 + F < P$

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 with the funds available for pension repayment, it does not provide any benefit to workers, and hence plays no role in determining
 40 payoffs. Since the surplus from continuation is C_2 , labor will obtain $C_1 + F + (1 - \mu)C_2$ in renegotiation. Therefore, management triggers renegotiation 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 sufficiently low compared with 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 liabilities 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. We thus have

10 **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 .

15 **2b. $C_1 + F < G < P$**

In this region, the pension guarantee of 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, which implies that the PBGC funds the difference between G and $C_1 + F$. Furthermore, because of the government guarantee, and in contrast to prior cases, the surplus from continuation to period 2 is now $C_1 + C_2 + F - G$.¹³ 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., the firm's prospects are sufficiently poor, compared with 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 be easily 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

30 **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 .

¹³ Recall that we assume for expositional simplicity that $G \leq C_1 + C_2 + F$.

Combining Lemmas 1–3 provides the following three predictions:

Prediction 1.

Ceteris paribus, 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 the firm's current and future cash flows, as well as its level of pension funding.

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 among pension plans in which the PBGC guarantee is relatively small compared with the pension obligations.

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

In this section, we briefly describe the negotiations between Delta Airlines and the approximately 9,000 pilots represented by the Air Line Pilots Association (ALPA), which 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 in the pilots' plans, implied that pension termination meant billions of dollars in potential losses for pilots.¹⁴

2.1 The prolonged first negotiation

In July 2001, Delta and ALPA's pilots signed a five-year contract that would make Delta's pilots the highest paid in the industry and included annual wage increases of 4.5%.¹⁵ However, as a result of the downturn in the industry that followed the September 11, 2001, 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 in May 2003 and May 2004.

¹⁴ This description relies on information obtained from articles in the *Wall Street Journal*, *Atlanta Journal-Constitution*, *New York Times*, *Associated Press*, *Financial Times*, and *Dow Jones Business News*.

¹⁵ 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 Continental, US Airways, United, and American Airlines pilots were \$145,060, \$132,715, \$131,930, and \$129,947, respectively.

Delta executives argued that this cut was necessary for the airline to remain competitive.

5 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 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.¹⁶ As negotiations drew on, however, Delta's condition deteriorated and thereby enhanced the firm's bargaining position vis-à-vis labor.

10 By the end of July, with Delta's condition continuing to deteriorate, management demanded an increased pay cut of 35%, amounting to \$1.02 billion a year in pilot concessions. Finally, on 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.

15 In return, pilots received options on Delta stock, as well as other profit-sharing arrangements. Table 1, Panel A, displays detailed information on wages and pension plan funding status for pilots and nonpilots for 2004, 2005, and 2006.¹⁷ Table 1, Panel B, 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, nonpilot employees were mostly covered by the PBGC guarantee and hence only agreed to a much smaller 10% wage cut.

2.2 The second negotiation

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

25 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. Furthermore, in

¹⁶ See *Wall Street Journal*, July 23, 2003, "Delta Pilots Contract Talks Break Down."

¹⁷ Data sources are described in detail in the next section.

Table 1
The Delta Airlines case study: Initial situation and negotiation outcomes for pilots and for nonpilots

	Pilots			Nonpilots		
	2004	2005	2006	2004	2005	2006
Panel A: Wage and Pension Plan Situation						
Number of employees	6,786	6,181	5,706	50,772	46,050	39,856
Wages						
– Total Wages (\$ million)	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 Guarantee (\$)	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 (\$ million)	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						
Before bankruptcy (Jan. 2003–Sep. 2005)						
– Average wage cut (%)		32.5			10.0	
– Pension plan status		Frozen			As usual (no change)	
After bankruptcy (Sep. 2005–Dec. 2006)						
– Average wage cut (%)		14.0			7.5	
– Pension plan status		Terminated			Frozen	

This table provides descriptive statistics on wages and pensions of pilots and nonpilots before and after Delta's bankruptcy (September 15, 2005). *Before Bankruptcy*: negotiations during 2003, 2004, and 2005 prior to bankruptcy. *After Bankruptcy*: negotiations during 2005 postbankruptcy and in 2006.

October of the same year, Delta received permission from the bankruptcy court to halt pension payments to retirees.

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 estimated that its pension plans were underfunded by \$4.6 billion. Furthermore, 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 reopen negotiations with Delta. Central to the negotiations was the future of the pilots' pension plan. 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 guarantee it would not terminate the pilots' pension plan.”¹⁸

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

¹⁸ *Atlanta Journal-Constitution*, December 6, 2005, “Judge Tells, Delta, Pilots to Work Out Differences.

counteroffer included concessions amounting to \$140 million a year and a demand for a \$1 billion note from Delta payable in case the pilots' pension plan was terminated. For the first time during negotiations, Delta's executives told the pilots that it was likely 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, which reduced average pilot pay from \$151,000 per year 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.

2.3 The pilots' pension plan termination

On September 1, 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 6, and thereby allowed Delta to avoid approximately \$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. The 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 Table 1, Panel A, shows, the pilots' pension plans were more underfunded than those of the nonpilot employees—postbankruptcy, the pilots agreed to an additional wage concession of 14%, compared with only 7.5% by nonpilots.

3. Data and Summary Statistics

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

3.1 Sample construction

We use two main data sources to construct our sample: 1) the Bureau of Transportation Statistics (BTS) data on individual airlines; and 2) data on airlines' pension plans from the Department of Labor's form 5500. We also supplement these data with information from Compustat and Thomson Securities Data Company (Thomson SDC).

3.1.1 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 attendants' wage.¹⁹ We thus divide the flight personnel group into two separate subgroups—flight attendants and pilots. This process yields annual wages for the six separate job categories that are used in our data analysis, including 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 fifteen different categories that group together employees with closely related jobs. We use the BTS Employment Categories Descriptions to assign each of the fifteen employee categories to one of the six job categories previously described.²⁰

For each of these six job categories, we then divide total wages of the group by the number of employees in that group in order 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.

3.1.2 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

¹⁹ 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.

²⁰ See Appendix A for a detailed description of job groups and categories.

profitability. Finally, using Compustat data, we construct yearly airline market-to-book ratios.²¹

3.1.3 Pension plans data. We obtain available data on all defined benefit pension plans that cover employees of U.S.-based airlines. Firms with defined benefit 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 one hundred or more active participants. All the plans in our sample are sponsored by a single employer.²² 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.²³ 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 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 later described). This matching is then used to relate pension plan information, such as pension underfunding, to our main dependent 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.²⁴ A third set of pension plans are specifically for nonunionized workers. For these cases, we calculate the average wage per employee by 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

²¹ We cannot construct market-to-book ratios for airline-year observations in which airlines are not publicly traded firms.

²² While there are multi-employer DB plans in other industries, all the airlines' defined benefit pension plans used in the article are single-employer plans.

²³ While other measures of underfunding exist, we use the common definition of underfunding used by the PBGC.

²⁴ 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.

workers without craft distinction.²⁵ 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 are therefore specifically for nonpilots. In these cases, we calculate the relevant average wage per employee associated with the plan by aggregating all nonpilot job categories together.

In matching the BTS and the Form 5500 data and restricting our sample to plans that have at least two observations, we end with 559 plan-year observations that correspond to fourteen different airlines.²⁶ Out of the 559 plan-year observations, 482 plan-year observations that represent twelve airlines have market-to-book data.²⁷ 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, which leads to a final sample size of 476 plan-year observations that span the years 1992–2006.

3.2 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 for on average 24.1% (median 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 employee 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.

²⁵ Some firms have an aggregate plan on top of their craft plans, while others have only aggregate plans for their workers (as is the case with United Parcel Services and Federal Express).

²⁶ There are three small airlines (Astar Air Cargo, Markair Inc., and ABX Air) for which the available data allow 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.

²⁷ The twelve 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.

Table 2
Summary statistics

	Mean	25th Percentile	Median	75th Percentile	Standard Deviation	Min	Max
Panel A: Wage and Benefit Variables							
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							
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 (\$ million)	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

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

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.²⁸ About 15.5% of our plan-year observations are linked to an airline in Chapter 11. As a measure of financial

²⁸ Note that these averages are based on plan-year observations and hence the data are weighted by plan-year observations per airline.

difficulties, 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 is zero otherwise.²⁹ The average earnings plus cash balances are \$336.0 million, and the average interest expense is \$231.8 million. The low cash flow dummy takes a value of one for 29.6% of the observations.³⁰

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 guarantee.³¹

4. 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 United States are highly unionized and have traditionally offered defined benefit pension plans to their employees enables us to study the use of underfunded defined benefits pension plans in wage renegotiation.

In particular, the BTS data provide detailed information on aggregate wages and number of employees in different job categories, which enables us to calculate the average wage in each of these job groups. These data are a major improvement over the wage data that are available in other data sets.³² Rather than providing aggregate wages to all employees in a firm, the BTS data provide intrafirm information across employee group categories. This detailed group-specific intrafirm information lies at the heart of our identification strategy.

²⁹ See Asquith, Gertner, and Scharfstein (1994) and Benmelech and Bergman (2008) for similar approaches.

³⁰ Our analysis is robust to other definitions of low cash flow or low profitability.

³¹ The benchmark annual guarantee used in this calculation is for a worker who retires at age sixty-five. Table A1 provides detailed information on the PBGC maximum guarantee.

³² For example, total wages are not always available in standard data sets. 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).

4.1 Identification

As shown in the model in Section 1, an airline is more likely to obtain concessions from labor when its financial condition is sufficiently poor. Furthermore, conditional on the occurrence of renegotiation, the model shows that employee concessions will be larger when the underfunding of their pension plan is greater, as in these cases the employees' outside option is lower. Finally, the model predicts that the effect of underfunding on wage concessions will be larger among plans in which the PBGC pension coverage is lower. Our identification strategy can be divided into two on the basis of these predictions.

We first show that airlines are more likely to obtain wage concessions when 1) the airline is financially constrained (measured either by having low cash flow or by being in bankruptcy); and 2) when the pension plan is underfunded. We interact the financial position of an airline with the funding status of the relevant pension plan in order to determine if employees that are exposed to the risk of losing their pension benefits are more willing to make concessions in firms in financial distress. 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 factors, such as airline profitability. However, by using an interaction term, we can limit the number of alternate 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 guarantee that is exogenously set 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.³³

Figures 1A–C display twenty-fifth, fiftieth, and seventy-fifth wage percentiles for different airline employee groups, relative to the PBGC

³³ Table B1 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 guarantee for a retiring 60-year-old worker is \$24,224, while that for a 65-year-old is \$37,268.

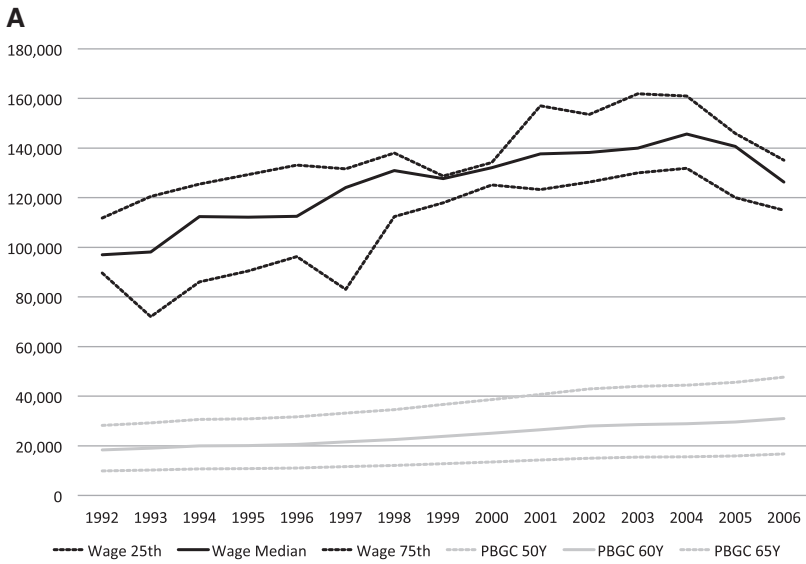


Figure 1A
Pilot wage quartiles and the PBGC max guarantee.

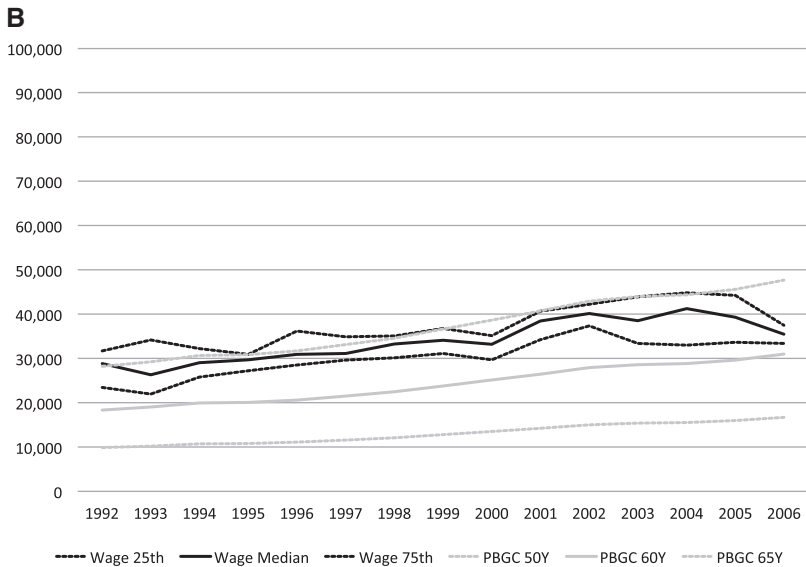


Figure 1B
Flight attendant wage quartiles and the PBGC max guarantee.

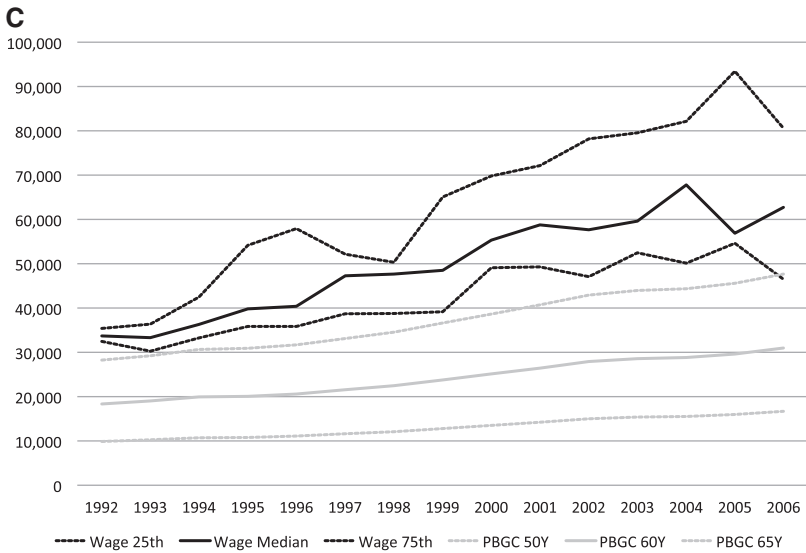


Figure 1C
Mechanic wage quartiles and the PBGC max guarantee.

maximum at different retirement ages. Figure 1A displays the data for pilots, Figure 1B displays the data for flight attendants, and Figure 1C displays the data for mechanics. Given that the PBGC guarantee is exogenously set by law, we use the difference between current wages of different airlines' 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. Focusing on the employee groups in Figure 1, pilots exhibit the largest difference, then mechanics, and finally flight attendants. We can therefore exploit the high dispersion in the difference between wages and the PBGC limit across different job categories within an airline to identify the bargaining power of the airlines vis-à-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 sixty-year-old retiree, and the average mechanic's 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 the extent that their pension plans are underfunded, pilots and mechanics will be in a weaker bargaining position than will 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% of

participants in plans taken over by the PBGC fall below this benefit limit, in some prominent cases, including those of some airline pilots, workers lose a substantial fraction of their promised retirement income.”³⁴

Econometrically, we identify the effect of pension underfunding on wage concessions by using a DDD specification. These three levels of differences are 1) financially distressed versus nondistressed airlines; 2) underfunded pension plans versus funded plans; and 3) wages exceeding versus those that are below the PBGC limit.³⁵ 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.

5. 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 benefit pension plans, and wage negotiations by estimating different variants of the following baseline specification:

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

where $\% \Delta(\text{wages/employees})$ 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;³⁶ *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 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 article report regression coefficients and standard errors that are clustered at the

³⁴ See Brown (2008), p. 184.

³⁵ This approach is common in applied microeconomics (see for example Gruber 1994) and has become more popular recently in corporate finance applications as well as in Rauh (2006b).

³⁶ Our results are not sensitive to this definition—we obtain similar results if we define low cash flow as airlines with nonpositive earnings, or as those airlines with profitability rates below the 33rd percentile.

Table 3
Wages and underfunding

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 (0.004)	0.081*** (0.021)	0.070*** (0.022)	0.000 (0.004)	0.054** (0.023)	0.050** (0.022)
Leverage	0.031 (0.071)	0.209** (0.085)	0.198** (0.085)	0.085 (0.072)	0.104 (0.077)	0.106 (0.076)
Market-to-Book	0.006 (0.013)	-0.010 (0.027)	-0.019 (0.024)	0.022 (0.015)	0.039 (0.027)	0.030 (0.029)
Wage Share	-0.021 (0.017)	-0.028 (0.023)	1.428*** (0.357)	-0.029* (0.014)	-0.038* (0.020)	1.364*** (0.431)
Profitability				0.154 (0.110)	0.218* (0.113)	0.188 (0.114)
Low Cash Flow	-0.014 (0.021)	-0.016 (0.023)	-0.020 (0.022)			
Underfunding	0.000 (0.010)	-0.009 (0.011)	-0.002 (0.017)	-0.006 (0.011)	-0.028** (0.012)	-0.019 (0.016)
Low Cash Flow × Underfunding	-0.045** (0.016)	-0.047*** (0.012)	-0.037** (0.015)			
Bankruptcy				-0.069*** (0.019)	-0.098** (0.032)	-0.097** (0.036)
Bankruptcy × Underfunding				-0.036 (0.029)	0.004 (0.031)	0.016 (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

The dependent variable in all regressions is the percentage change in (Wages/Employees). All regressions include an intercept (not reported). The regressions control for size, leverage, market-to-book, wage share, low cash flow dummy, underfunding dummy (an indicator variable that equals one if underfunding is larger than zero), and bankruptcy dummy. 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 fixed effects as well as either airline or plane fixed effects. Standard errors are calculated by clustering at the airline level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

airline level. Our main coefficient of interest is β_{12} —the coefficient of the interaction term. This coefficient captures the joint effect of airline financial distress and the underfunding of the pension plan of an employee group within an 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 consistently negative and statistically significant—distressed airlines obtain wage concessions from the employee groups whose pension

plans are underfunded.³⁷ Our results hold after controlling for airline-specific controls, year fixed effects, and both airline and plan fixed effects.³⁸ The estimates of β_{12} are between -3.7% and -4.7% , suggesting that airlines obtain wage concessions that are around 4% 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.³⁹ 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 perform most 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.

20 6. Wages, Pension Underfunding, and the PBGC Maximum Guarantee

The results thus far show that wages are more likely to be negotiated downward during periods of financial distress when defined benefits plans are underfunded. While the evidence is consistent with underfunded pensions increasing firm bargaining power during wage renegotiation, it is also possible that pension underfunding merely reflects deep financial distress. In accordance with this alternate view, the specific mechanism is not the threat of pension-dumping but 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.

³⁷ While the coefficients of both low cash flow and underfunding are negative, they are not statistically different from zero.

³⁸ Obviously, we cannot control for both airline and plan fixed effects at the same time as employee groups are defined at the airline level.

³⁹ 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).

6.1 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 among employee groups whose pensions are not fully covered by the PBGC guarantee.⁴⁰ 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:

$$\begin{aligned}
 \% \Delta(\text{wages/employees})_{a,i,t} = & \beta_1 \times \text{low cash flow}_{a,i,t} + \beta_2 \times \text{underfunding}_{a,i,t} \\
 & + \beta_3 \times \text{PBGC}_{a,i,t} \\
 & + \beta_{12} \times (\text{low cash flow}_{a,i,t} \times \text{underfunding}_{a,i,t}) \\
 & + \beta_{13} \times (\text{low cash flow}_{a,i,t} \times \text{PBGC}_{a,i,t}) \\
 & + \beta_{23} \times (\text{underfunding}_{a,i,t} \times \text{PBGC}_{a,i,t}) \\
 & + \beta_{123} \times (\text{low cash flow}_{a,i,t} \times \text{underfunding}_{a,i,t} \\
 & \quad \times \text{PBGC}_{a,i,t}) \\
 & + \mathbf{b}_a \gamma + \mathbf{c}_i \delta + \mathbf{d}_t \theta + \mathbf{X}_{a,i,t} \lambda + \epsilon_{a,i,t},
 \end{aligned}
 \tag{2}$$

where $\% \Delta(\text{wages/employees})$ 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 an 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 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 $\epsilon_{a,i,t}$

⁴⁰ We emphasize here that we are *not* claiming that airlines strategically underfund pension plans ex ante in order to obtain wage concessions from employees. While this may be true, we have no direct evidence of this effect. Rather, we are testing the hypothesis that ex post, having arrived to a situation in which a plan is underfunded, airlines are strategically using underfunding to their advantage in bargaining with employees.

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.

5 While the level of benefits accrued in airlines' defined benefit pensions varies by airline and occupation, they typically range between 50% and 80% ("Pension Plan Overview and the Effect of Pension Termination," Association of Flight Attendants 2005). We use 1.5 times the PBGC annual maximum guarantee threshold to capture two-thirds of average salary benefits. Our results are not sensitive to this definition, and in
10 unreported results we document similar patterns when using a two times the PBGC annual maximum guarantee threshold.

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% .
15 Thus, consistent with strategic wage renegotiation, airlines in financial distress can successfully 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
20 airline-specific controls. When including plan fixed effects, the combination of the $Wage > PBGC$ and DDD coefficients indicates that, while high-wage employee groups usually get a raise, they do not get this raise when cash flows are low and their pension is underfunded.⁴¹

In the last three columns of Table 4, 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.⁴² We also find
25 that airline leverage is positively associated with wage growth. One potential explanation is that airlines less focused on cost controls—and in particular on reducing the rate of wage growth—finance their additional expenses by issuing debt. At the level of simple correlations, this is supported by the fact that leverage is negatively and significantly correlated
30 with profitability.

35 We supplement our analysis by regressing the change in average wages (instead of the percentage change) and report results in Table 5, Panel A. All the regressions in Table 5 control for the same explanatory variables,

⁴¹ We note, though, that this is quite consistent with the notion that bargaining power is reduced when cash flows are low, pensions are underfunded, and the PBGC does not supply ample insurance. Our hypothesis is silent regarding the general baseline time trend for high-wage groups.

⁴² While higher levels of underfunding should lead to higher concessions, there is not enough variation to precisely estimate the 25% underfunding effect.

Table 4
Wages underfunding and PBGC coverage

Dependent Variable=	% change in wages/ employees	% change in wages/ employees	% change in wages/ employees	underfunding >		
				10% % change in wages/ employees	15% % change in wages/ employees	25% % change in wages/ employees
Ln(Assets)	0.000 (0.005)	0.086*** (0.021)	0.061** (0.024)	0.062** (0.028)	0.064** (0.029)	0.060* (0.028)
Leverage	0.043 (0.076)	0.216** (0.084)	0.200** (0.082)	0.200** (0.075)	0.202** (0.072)	0.206*** (0.067)
Market-to-Book	0.004 (0.013)	-0.009 (0.027)	-0.014 (0.027)	-0.011 (0.024)	-0.008 (0.024)	-0.003 (0.023)
Wage Share	-0.008 (0.021)	-0.012 (0.028)	1.106*** (0.322)	1.152*** (0.322)	1.143*** (0.330)	1.169*** (0.341)
Low Cash Flow	-0.032 (0.026)	-0.035 (0.026)	-0.034 (0.022)	-0.034 (0.026)	-0.037 (0.030)	-0.019 (0.026)
Underfunding	-0.013 (0.018)	-0.028 (0.022)	-0.029 (0.024)	-0.006 (0.021)	-0.001 (0.026)	-0.017 (0.020)
Wage > PBGC	0.009 (0.017)	0.009 (0.012)	0.120*** (0.034)	0.129*** (0.039)	0.131*** (0.041)	0.137*** (0.042)
Low Cash Flow × Underfunding (Wage > PBGC)	-0.008 (0.021)	-0.003 (0.017)	0.010 (0.020)	0.012 (0.026)	0.018 (0.032)	-0.021 (0.026)
× Underfunding	0.036 (0.025)	0.049 (0.028)	0.042 (0.025)	0.029 (0.027)	0.025 (0.025)	0.026 (0.031)
Low Cash Flow × (Wage > PBGC)	0.052 (0.030)	0.053 (0.032)	0.056* (0.031)	0.029 (0.034)	0.037 (0.034)	0.006 (0.040)
Low Cash Flow × Underfunding × (Wage > PBGC)	-0.093** (0.030)	-0.102*** (0.025)	-0.112*** (0.024)	-0.092* (0.048)	-0.114** (0.041)	-0.076** (0.034)
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

The dependent variable in all regressions is the percentage change in (Wages/Employees). All regressions include an intercept (not reported). The regressions control for size, leverage, market-to-book, wage share, low cash flow dummy, underfunding dummy (an indicator variable that equals one if underfunding is larger than zero (first three columns), 10% (column 4), 15% (column 5), and 25% (column 6)), and Wage > PBGC dummy (an indicator variable that takes the value of one if the wage is larger than 1.5 × PBGC maximum guarantee). The regressions also include interaction terms between the low cash flow, underfunding, and Wage > PBGC dummies and a triple interaction term as well. All regressions include year fixed effects as well as either airline or plan fixed effects. Standard errors are calculated by clustering at the airline level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

as in earlier regressions; however, for brevity, we do not report their coefficients. The DDD estimator β_{123} estimates the average amount (in dollars) that financially constrained airlines extract from employees whose average wage exceeds the PBGC limit when their pension plans

Table 5
Actual wage concessions (\$ change)

Dependent Variable =	\$ change in wages/employees	\$ change in wages/employees	\$ change in wages/employees	underfunding >		
				10% \$ change in wages/employees	15% \$ change in wages/employees	25% \$ change in wages/employees
Panel A: Wages Underfunding and PBGC Coverage (\$ Change)						
Low Cash Flow	-12,252***	-12,975***	-14,795***	-13,039***	-16,983**	-17,360**
× Underfunding (2,874)	(2,874)	(2,847)	(3,100)	(3,872)	(6,143)	(7,078)
× (Wage > PBGC)						
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)						
Bankruptcy	-12,778	-14,372*	-13,549	-13,028*	-22,621*	-22,552
× Underfunding (7,395)	(7,395)	(7,073)	(7,707)	(7,246)	(11,461)	(13,011)
× (Wage > PBGC)						
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

The dependent variable in all regressions is the dollar change in (Wages/Employees). All regressions include an intercept (not reported) and the standard set of control variables. Standard errors are calculated by clustering at the airline level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

are underfunded. As the first three columns of the table show, airlines can use underfunded pensions strategically to reduce the average wage of relatively high-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 high-paid employees by an annual amount of \$16,983 and \$17,360, respectively.

6.2 Robustness tests

6.2.1 Controlling for airline*year fixed effects. 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 reported 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 with -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% 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). When underfunding is defined at the 15% level, then β_{123} equals -0.098 and is significant at the 6%. Finally, as before, we do not find significant results when deep underfunding is calculated at an underfunding level of 25%.

6.2.2 Controlling for employee group effects and placebo analysis. 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 high-paid pilots' wages downward—not because of the fact that their pensions are not covered by the PBGC—simply because pilots have larger slack in which to make wage concessions.⁴³

This concern is alleviated in three ways. First, throughout the article and in every regression, we control for the ratio between the wage of an employee group and the overall wage expense of the airline. For example, we divide the aggregate wages of pilots by the total wage expenses of the airline. We find that the results are always robust to the inclusion of this wage share variable. However, it is possible that a linear control for the wage share does not fully absorb variation coming from high-paid employees or from employees that account for a larger share of the airline's expenses.

Second, we control directly for specific job group fixed effects and show that our results are robust to these effects. As Table 7 shows,

⁴³ 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 the level of pilot wages being higher than that of other groups.

Table 6
Wages, underfunding, and PBGC coverage (controlling for airline-year fixed effects)

Dependent Variable =	% change in wages/employees	underfunding >		
		10% % change in wages/employees	15% % change in wages/employees	25% % change in wages/employees
Wages Share	−0.008 (0.025)	0.000 (0.023)	0.002 (0.021)	0.003 (0.021)
Underfunding	−0.045 (0.028)	−0.049 (0.033)	−0.038 (0.031)	−0.044** (0.015)
Wage > PBGC	−0.002 (0.014)	0.013 (0.012)	0.018 (0.013)	0.020 (0.014)
Low Cash Flow	0.035 (0.024)	0.041 (0.043)	0.058 (0.050)	0.057 (0.034)
× Underfunding (Wage > PBGC)	0.052 (0.034)	0.038 (0.039)	0.030 (0.031)	0.036 (0.044)
Low Cash Flow × (Wage > PBGC)	0.044 (0.031)	0.027 (0.030)	0.036 (0.035)	0.002 (0.036)
Low Cash Flow × Underfunding × (Wage > PBGC)	−0.092** (0.039)	−0.081 (0.054)	−0.098* (0.047)	−0.047 (0.057)
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

The dependent variable in all regressions is the percentage change in (Wages/Employees). All regressions include an intercept (not reported) and year*airline fixed-effects. Airline-level controls (size, leverage, market-to-book, low cash flow dummy) are fully absorbed by airline*year fixed-effects. Regressions control for 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)), and Wage > PBGC dummy (an indicator variable 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 interaction term as well. All regressions include year*airline fixed effects. Standard errors are calculated by clustering at the airline level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

after controlling for pilot, flight attendant, and mechanic fixed effects, in addition to year, airline, and plan fixed effects, β_{123} , the DDD coefficient, is statistically significant, with an economic magnitude that is between 9.7% and 11.2%. Moreover, in unreported results, we also estimate regressions with (job group)*year fixed effects—on top of year, airline, or plan fixed effects—and find that our results still hold.⁴⁴ We are able to

⁴⁴ As in Table 4, while β_{123} is negative, the combination of the Wage > PBGC and DDD coefficients indicates that although high-wage employee groups usually get a raise, they do not get this raise when cash flows are low and their pension is underfunded.

Table 7
Wages, underfunding, and PBGC coverage (controlling for job group fixed effects for pilots, flight attendants, and mechanics)

Dependent Variable =	% change in wages/ employees	% change in wages/ employees	% change in wages/ employees	underfunding >		
				10% % change in wages/ employees	15% % change in wages/ employees	25% % change in wages/ employees
Ln(Assets)	-0.003 (0.004)	0.076*** (0.019)	0.061** (0.024)	0.062** (0.028)	0.064** (0.029)	0.060* (0.028)
Leverage	0.072 (0.071)	0.213** (0.082)	0.200** (0.082)	0.200** (0.075)	0.202** (0.072)	0.206*** (0.067)
Market-to-Book	-0.018 (0.013)	-0.008 (0.027)	-0.014 (0.027)	-0.011 (0.024)	-0.008 (0.024)	-0.003 (0.023)
Wage Share	0.028 (0.017)	0.035 (0.028)	1.106*** (0.322)	1.152*** (0.322)	1.143*** (0.330)	1.169*** (0.341)
Pilot Plan	-0.083*** (0.025)	-0.077** (0.027)	0.563* (0.306)	0.595* (0.299)	0.605* (0.305)	0.611* (0.306)
Flight Att. Plan	0.027** (0.010)	0.035*** (0.007)	1.031** (0.361)	1.072** (0.356)	1.071** (0.365)	1.110** (0.369)
Mechanics Plan	0.052** (0.019)	0.059*** (0.015)	0.932** (0.358)	0.959** (0.348)	0.955** (0.360)	1.002** (0.363)
Low Cash Flow	-0.044* (0.024)	-0.041 (0.026)	-0.034 (0.022)	-0.034 (0.026)	-0.037 (0.030)	-0.019 (0.026)
Underfunding	-0.017 (0.017)	-0.026 (0.018)	-0.029 (0.024)	-0.006 (0.021)	-0.001 (0.026)	-0.017 (0.020)
Wage > PBGC	0.078*** (0.022)	0.080*** (0.019)	0.120*** (0.034)	0.129*** (0.039)	0.131*** (0.041)	0.137*** (0.042)
Low Cash Flow × Underfunding (Wage > PBGC)	0.010 (0.022)	0.009 (0.019)	0.010 (0.020)	0.012 (0.026)	0.018 (0.032)	-0.021 (0.026)
× Underfunding	0.041 (0.024)	0.046* (0.025)	0.042 (0.025)	0.029 (0.027)	0.025 (0.025)	0.026 (0.031)
Low Cash Flow × (Wage > PBGC)	0.066** (0.024)	0.064* (0.031)	0.056* (0.031)	0.029 (0.034)	0.037 (0.034)	0.006 (0.040)
Low Cash Flow × Underfunding × (Wage > PBGC)	-0.097*** (0.025)	-0.106*** (0.025)	-0.112*** (0.024)	-0.092* (0.048)	-0.114** (0.041)	-0.076** (0.034)
Adjusted R ²	0.13	0.16	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

The dependent variable in all regressions is the percentage change in (Wages/Employees). All regressions include an intercept (not reported). The regressions control for size, leverage, market-to-book, wage share, low cash flow dummy, underfunding dummy (an indicator variable that equals one if underfunding is larger than zero (first three columns), 10% (column 4), 15% (column 5), and 25% (column 6)), and Wage > PBGC dummy (an indicator variable that takes the value of one if the wage is larger than 1.5 × PBGC maximum guarantee). The regressions also include interaction terms between the low cash flow, underfunding, and Wage > PBGC dummies and a triple interaction term as well. All regressions include job group fixed effects for pilots, flight attendants, and mechanics. All regressions include year fixed effects as well as either airline or plan fixed effects. Standard errors are calculated by clustering at the airline level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

control for both plan and employee group fixed effects, since for some plans there are several employee groups per plan. Out of the 476 plan-year observations in the main sample, 241 observations have several employee groups of the same airline, hence our ability to include both effects.

The third method we use to alleviate the concern that a specific job group—in particular, pilots—is driving our results is a placebo analysis. We note that the alternate hypothesis that high-paid employees have larger concession margins in renegotiation does not easily 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 high-paid employee groups, rather than by the 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 benefit pension plans—mostly small regional airlines, with the exception of Southwest and JetBlue.⁴⁵ For each of these airlines, we define within-airline placebo employee groups using the same employee group classification used throughout our previous analysis (pilots, mechanics, etc.). Next, we run a set of double interaction regressions with the annual change in employee group wages as the dependent variable. As the independent variables, the regressions include the low cash flow dummy variable, the PBGC-based dummy variable (that takes on a value of one if the average annual wage of a given employee group is larger than 1.5 times the PBGC annual maximum guarantee), and the interaction between these two variables. 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 benefit pension plans are small.⁴⁶ We separately run the regressions for airlines with deeply underfunded pension plans at levels greater than 10% or 15% (the treatment group) and airlines with no defined benefit plans (placebo). As Table 8 shows, the coefficients 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

⁴⁵ The minimum size of an airline in the BTS data is \$20 million.

⁴⁶ We cannot control for market-to-book given that the vast majority of the smaller airlines are not publicly traded.

Table 8
Cash flow and high wages: Placebo test

Dependent Variable =	DB airlines		DB airlines		Non-DB Plan airlines	
	Underfunding > 10%		Underfunding > 15%			
	% 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 (0.378)	-0.542 (0.367)	-0.405 (0.364)	-0.366 (0.334)	-0.014 (0.055)	-0.012 (0.059)
Ln(Assets) Squared	0.024 (0.021)	0.039* (0.021)	0.029 (0.021)	0.028 (0.020)	0.001 (0.005)	0.002 (0.006)
Leverage	0.175 (0.180)	0.101 (0.205)	0.219 (0.214)	0.179 (0.212)	0.024 (0.050)	0.032 (0.050)
Wage Share	-0.028 (0.053)	1.487** (0.571)	-0.025 (0.063)	1.518* (0.705)	0.152** (0.065)	0.534*** (0.117)
Low Cash Flow	-0.040 (0.028)	-0.032 (0.041)	-0.029 (0.025)	-0.048 (0.038)	0.022 (0.046)	0.024 (0.049)
Wage > PBGC	0.082*** (0.021)	0.226* (0.122)	0.095*** (0.024)	0.222** (0.077)	0.194*** (0.049)	0.289*** (0.051)
Low Cash Flow × (Wage > PBGC)	-0.071* (0.033)	-0.079 (0.053)	-0.102*** (0.029)	-0.062 (0.047)	0.028 (0.073)	0.002 (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

The dependent variable in all regressions is the percentage change in (Wages/Employees). All regressions include an intercept (not reported). The regressions control for size and size-squared, leverage, wage share, low cash flow dummy, and Wage > PBGC dummy (an indicator variable that takes the value of one if the wage is larger than 1.5 × PBGC maximum guarantee). The regressions also include an interaction term between the low cash flow and Wage > PBGC dummies. All regressions include year fixed effects as well as either airline or plan fixed effects. Columns 1 and 2 consider only airlines with defined benefit plans that are underfunded by at least 10%. Columns 3 and 4 consider only airlines with defined benefit plans that are underfunded by at least 15%. Columns 5 and 6 consider airlines without defined benefit plans. Standard errors are calculated by clustering at the airline level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

5 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, close to zero (either 0.02 or 0.028), and not statistically significant. The airlines in the two samples are different, e.g., the average size of an airline with DB pension plan is \$11.8 billion and non-DB airlines are considerably smaller (\$0.735 billion). Likewise, the average wage in DB airline is \$66,824 compared with \$44,911 in non-DB airlines. However, it is still the case that pilots are paid more in non-DB airlines as well. Had our results been driven by some employee groups that make concessions for reasons

that are unrelated to pension underfunding—e.g., high-paid pilots having greater slack to make concessions—the interaction term should have been negative and significant in the placebo regressions as well.

6.2.3 Unionization and negotiation outcomes. Finally, while we do not directly control for unionization levels, 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. In accordance with Hirsch and Macpherson's (2003) estimates, 45.1% of air transportation employees were unionized in 2008. Moreover, by studying airlines with defined benefit pension plans, we mostly focus on the most unionized airlines within the airline industry.⁴⁷ 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.⁴⁸ Some airlines report the actual number of their employees that are unionized, while others just state whether or not a large share of their employees are unionized. 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 the Appendix 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.

6.3 Differences-in-differences-in-differences: Airlines in Chapter 11

We now turn to analyze the effect of Chapter 11 on wage negotiations by 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

⁴⁷ For example, JetBlue, the prominent example of a nonunionized airline has no defined benefit pension plan and hence is not included in our sample.

⁴⁸ Airline 10-Ks are available in Edgar online starting at 1995.

analysis, we estimate different specifications of the following baseline regression:

$$\begin{aligned}
 \% \Delta(\text{wages/employees})_{a,i,t} = & \beta_1 \times \text{bankruptcy}_{a,i,t} + \beta_2 \times \text{underfunding}_{a,i,t} \\
 & + \beta_3 \times \text{PBGC}_{a,i,t} \\
 & + \beta_{12} \times (\text{bankruptcy}_{a,i,t} \times \text{underfunding}_{a,i,t}) \\
 & + \beta_{13} \times (\text{bankruptcy}_{a,i,t} \times \text{PBGC}_{a,i,t}) \\
 & + \beta_{23} \times (\text{underfunding}_{a,i,t} \times \text{PBGC}_{a,i,t}) \\
 & + \beta_{123} \times (\text{bankruptcy}_{a,i,t} \times \text{underfunding}_{a,i,t} \\
 & \quad \times \text{PBGC}_{a,i,t}) \\
 & + \mathbf{b}_a \gamma + \mathbf{c}_i \delta + \mathbf{d}_t \theta + \mathbf{X}_{a,t} \lambda + \epsilon_{a,i,t}.
 \end{aligned}
 \tag{3}$$

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% level. Furthermore, 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 change in average wages (in dollars) instead of the percentage change as a dependent variable and report the results in Panel B of Table 5. The average amount (in dollars) 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.

7. Conclusion

We analyze the ability of airlines to renegotiate wages, using their financial position to extract concessions from labor. Our empirical results indicate that airlines in poor financial positions are able to renegotiate and reduce labor costs of those employees whose pension plans are underfunded. Furthermore, by 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 take advantage of their financial position when negotiating with labor and strategically use the threat of

Table 9
Wages, underfunding, bankruptcy, and PBGC coverage

Dependent Variable =	% change in wages/employees	% change in wages/employees	% change in wages/employees	underfunding >		
				10% wages/employees	15% wages/employees	25% wages/employees
Ln(Assets)	0.000 (0.005)	0.058** (0.022)	0.045* (0.021)	0.045* (0.023)	0.039* (0.022)	0.043 (0.024)
Leverage	0.097 (0.076)	0.109 (0.075)	0.123 (0.078)	0.130 (0.074)	0.118 (0.070)	0.123 (0.071)
Market-to-Book	0.018 (0.015)	0.043 (0.027)	0.031 (0.031)	0.027 (0.029)	0.026 (0.029)	0.028 (0.027)
Wage Share	-0.017 (0.017)	-0.022 (0.023)	1.064** (0.384)	1.096** (0.370)	1.076*** (0.341)	1.074*** (0.341)
Profitability	0.164 (0.108)	0.213* (0.111)	0.185 (0.110)	0.162 (0.117)	0.143 (0.100)	0.152 (0.099)
Bankruptcy	-0.088*** (0.009)	-0.138*** (0.027)	-0.113** (0.045)	-0.113** (0.037)	-0.093* (0.044)	-0.082 (0.053)
Underfunding	-0.014 (0.020)	-0.045* (0.025)	-0.041 (0.025)	-0.019 (0.016)	-0.006 (0.024)	-0.030* (0.014)
Wage > PBGC	0.015 (0.014)	0.013 (0.014)	0.123*** (0.037)	0.131*** (0.038)	0.132*** (0.042)	0.134*** (0.045)
Bankruptcy × Underfunding (Wage > PBGC)	0.003 (0.031)	0.068** (0.031)	0.060 (0.043)	0.071*** (0.022)	0.044 (0.027)	0.044 (0.044)
× Underfunding (Wage > PBGC)	0.023 (0.027)	0.040 (0.033)	0.032 (0.033)	0.020 (0.027)	0.016 (0.022)	0.034 (0.033)
Bankruptcy × (Wage > PBGC)	0.048 (0.032)	0.075* (0.035)	0.069** (0.028)	0.048 (0.027)	0.082** (0.031)	0.056** (0.023)
Bankruptcy × Underfunding × (Wage > PBGC)	-0.095 (0.058)	-0.128** (0.054)	-0.115* (0.063)	-0.100* (0.051)	-0.164** (0.059)	-0.148* (0.068)
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

The dependent variable in all regressions is the percentage change in (Wages/Employees). All regressions include an intercept (not reported). The regressions control for size, leverage, market-to-book, wage share, profitability, bankruptcy dummy, 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)), and Wage > PBGC dummy (an indicator variable that takes the value of one if the wage is larger than 1.5 × PBGC maximum guarantee). The regressions also include interaction terms between the bankruptcy, underfunding, and Wage > PBGC dummies and a triple interaction term as well. All regressions include year fixed effects as well as either airline or plan fixed effects. Standard errors are calculated by clustering at the airline level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

“pension dumping” to extract concessions from labor. As such, our article should be viewed as part of the growing body of literature on the interplay between finance and labor market conditions. Recent events in the financial crisis of 2007–2009 and the ongoing disruptions in the labor market underscore the importance of a deeper understanding of such firm-labor interactions.

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Appendix

A.1 Variable Description and Construction

For reference, the following is a list of variables used in the article, their sources, and a brief description of how each variable is constructed.

1. *Assets (Size)*: The firm's total assets [BTS Schedule B-1 data item 18990] in million dollars. (Source: Bureau of Transportation Statistics, Form 41 Financial Data.)
 2. *Bankruptcy dummy*: Takes a value of one if the firm is bankrupt during a particular year and zero otherwise.
 3. *Earnings*: The firm's income before discontinued operations and extraordinary items [BTS Schedule P-12 data item 91990] + depreciation and amortization [BTS Schedule P-12 data item 70000]. (Source: Bureau of Transportation Statistics, Form 41 Financial Data.)
 4. *High-wage dummy ($Wage > 1.5 * PBGC$)*: Takes a value of one if the wage per employee of the particular job group being analyzed is
- 30
- 35
- 40

larger than 1.5 times the maximum PBGC guarantee for that particular year and zero otherwise.

- 5 5. *Job groups or categories*: The BTS Form 41 Schedule P-10 groups workers in 15 different categories, while the wage information we have gathered classifies them into six categories. The BTS's employment category descriptions are used to match the fifteen employee categories with the six wage categories. This grouping is as follows: 1) pilots (pilots & co-pilots + other flight personnel); 2) flight attendants (passenger/general services & administration); 10 3) mechanics & maintenance (maintenance); 4) traffic and handling (aircraft & traffic handling group 1 + General Aircraft & Traffic Handling + Aircraft Control + Passenger Handling + Cargo Handling); 5) General Management (General Manager); and 6) Other (Trainees & Instructor + Statistical + Traffic Solicitors + Other + Transport Related). 15
6. *Leverage*: The firm's total current liabilities [BTS Schedule B-1 data item 21990] + long-term debt [BTS Schedule B-1 data item 22100] all over total assets [BTS Schedule B-1 data item 18990]. (Source: Bureau of Transportation Statistics, Form 41 Financial Data.) 20
7. *Low cash flow dummy*: Takes a value of one if the firm's earnings + cash balances [BTS Schedule B-1 data item 10100] are smaller than its interest expenses (which are defined as the interest on long-term debt and capital leases [BTS Schedule P-12 data item 81810] + other interests [BTS Schedule P-12 data item 81820]) and zero otherwise. 25
8. *Market-to-book*: The firm's market value of equity [Compustat Annual Items 24*25] + book value of assets [Compustat Annual Item 6] minus the book value of equity [Compustat Annual Item 60] all over book value of assets [Compustat Annual Item 6]. (Source: Compustat.) 30
9. *Maximum guarantee (by PBGC)*: The maximum yearly amount the Pension Benefit Guaranty Corporation insures in case of a defined benefit pension plan termination. This amount depends both on the age of the worker at the time of retirement and on the calendar year in which the worker retires. If a worker's vested pension benefits are lower than the PBGC maximum guarantee, the worker receives no more than the maximum guarantee upon pension plan termination. (Source: Pension Benefit Guaranty Corporation.) 35 40
10. *Profitability*: Earnings over total assets [BTS Schedule B-1 data item 18990]. (Source: Bureau of Transportation Statistics, Form 41 Financial Data.)

11. *Relative (%) change in wages per employee*: The wages per employee at time (t) minus wages per employee at time ($t - 1$) all over wages per employee at time ($t - 1$).
- 5 12. *Underfunding*: The current liability of total benefits (for all participants) [IRS Form 5500 Schedule B] – (plan) total assets [IRS Form 5500 Schedule H]. Note that this is positive when there is plan underfunding and negative when there is overfunding. For years 1992 to 1994, the OBRA87 current liability is used, while for 1995 to 2006 the RPA94 current liability is employed. (Source: 10 IRS Form 5500.)
13. *Underfunding Dummies*: Takes a value of one if underfunding is larger than a certain percentage of plan total assets, and zero otherwise. The benchmark is underfunding larger than zero, but different thresholds are used to analyze deep underfunding. In 15 particular, we define dummies for underfunding >10% of plan total assets, underfunding >15% of plan total assets, and underfunding >25% of plan total assets.
14. *Wages per employee*: The total amount of wages given to an employee group in a year over the total number of employees in 20 that group that year. The variable used in the regressions refers to the wages per employee of the particular job category (or categories) that matches the employee group covered by a certain defined benefit pension plan. A detailed description of how this variable is constructed is offered in the Sample Construction section. (Source: Bureau of Transportation Statistics, Form 41 25 Financial Data.)
15. *Wage share*: The ratio of the wage of an employee group to the overall wage expense of the airline.

Table A1
Maximum annual guarantees given by PBGC

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

	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 one if the firm has three or more unions and zero 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%