Are relative performance measures in CEO incentive contracts used for risk reduction and/or strategic interaction?

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ABSTRACT

A long stream of accounting research examines the use of relative performance evaluation (RPE) in CEO incentive contracting in order to remove industry-wide risk factors as predicted by agency theory. This study examines whether RPE has the additional role of motivating strategic interaction between own-firm and peer-firm managers, as industrial organization theory predicts, and whether the two objectives of RPE are mutually exclusive. Using data from the U.S. airline industry, I first document empirical support for the strong-form (but not the weak-form) RPE hypothesis, suggesting that firms entirely remove noise from relative performance measures. Importantly, I further hypothesize and find that CEO pay-for-peer-firm-performance sensitivity is negative (positive) when firms compete in strategic substitutes (complements), indicating that RPE has directionally opposite effects on CEO incentives (depending on the type of strategic competition) that cancel each other in aggregate. This result explains the lack of support for the weak-form RPE hypothesis by attributing it to empirical model misspecification. However, the information and strategic objectives of RPE are not mutually exclusive. Once I decompose aggregate firm performance into systematic (i.e., common) and unsystematic (i.e., unique) components, I find that firms filter out common risk from CEO incentive contracts and use the unsystematic component of performance to influence strategic interaction. This study suggests that firms provide managerial incentives that are contingent on their own and peer firms' performance measures in order to both influence strategic interaction with peer firms and reduce the risk placed on their own managers.

Keywords: CEO Compensation, Managerial incentives, Strategic interaction, Product market competition, Strategic substitutes, Strategic complements, Relative performance measures.

I. Introduction

Agency research in accounting posits that CEO compensation is linked to firm performance in order to align managers' interests with those of shareholders (Lambert and Larcker, 1987; Sloan, 1993; Core and Guay, 1999; Bushman and Smith, 2001; Lambert, 2001; Core, Guay and Verrecchia, 2003). Within this broad literature, an extensive stream of accounting research examines whether firms use relative performance measures in CEO incentive contracts to remove industry-wide risk factors that are beyond the CEO's control, i.e., the relative performance evaluation hypothesis or RPE (Antle and Smith, 1986; Jensen and Murphy, 1990; Janakiraman, Lambert and Larcker, 1992; Aggarwal and Samwick, 1999a,b; Albuquerque, 2009). Specifically, agency literature predicts negative CEO pay-for-peer-firm-performance sensitivity when firms' outcomes are correlated to some degree. However, empirical evidence on the relative performance evaluation hypothesis is mixed.

The strategic competition that takes place among firms in some settings may offer an explanation of why empirical evidence on the RPE hypothesis is mixed. Although agency theory addresses intra-firm managerial incentive issues, it does not address the implications of managerial incentives on CEOs' strategic behavior in settings in which there are inter-dependencies among firms (i.e., in imperfectly competitive or oligopolistic settings). In imperfectly competitive settings, many CEO decisions are strategic in the sense that they affect both own-firm outcomes and peer-firm outcomes, thus drawing a competitive response from the CEOs of peer firms (Vickers, 1985; Fershtman, 1985). When firms compete with each other, their managers' strategic interaction is likely to be of equal importance to the mitigation of intra-firm managerial agency problems. This discussion illustrates how agency theory may provide an incomplete picture of the uses of managerial incentives and thus offer an incomplete representation of the role of accounting performance measures in managerial incentive contracting. My research addresses two questions. First, I investigate whether relative performance measures in CEO compensation contracts are used to provide incentives to managers to either increase or reduce strategic competition with peer firms in oligopolistic settings. Second, I investigate the extent to which the use of relative performance measures in CEO compensation contracts for strategic objectives conflicts with the further use of these measures for risk-reduction objectives.

In imperfectly competitive settings, firms compete either in strategic substitutes or strategic complements (Bulow, Geanakoplos, and Klemperer, 1985). A pair of firms competes in strategic substitutes, or their decisions are strategic substitutes, when more "aggressive" play (e.g., lower price, higher output quantity, larger advertising expenditure, higher R&D investment) by one firm raises that firm's marginal profitability and lowers the peer firm's marginal profitability. For instance, market share competition in a commodity-type or slow-growth product market is often competition in strategic substitutes, as one firm's gain is directly associated with another firm's loss. A pair of firms competes in strategic complements, or their decisions are strategic complements, when more "aggressive" play by one firm raises both firms' marginal profitability. For instance, competition in a differentiated or high-growth product market often takes the form of competition in strategic complements, since all firms may profitably raise their price in a differentiated product market or profitably grow their output as "the pie gets bigger" in a high-growth product market.

Industrial organization theory predicts that in oligopolistic product markets, managerial incentives are a strategic variable (Vickers, 1985; Fershtman, 1985; Fershtman and Judd, 1987; Sklivas, 1987; Fumas 1992; Aggarwal and Samwick, 1999b). Managerial incentives motivate managers to behave aggressively in the product market when firms' decisions are strategic substitutes in order to deter competitors. In contrast, managerial incentives are geared towards softening competition in the product market when firms' decisions are strategic complements in order to foster cooperative behavior by competitors. When firms compete in strategic substitutes (complements), pay-for-peer-firm performance sensitivity is negative (positive), i.e., the strategic interaction hypothesis (Fumas, 1992; Aggarwal and Samwick, 1999b). However, empirical evidence on the strategic interaction hypothesis is scarce and indirect (Joh, 1999; Aggarwal and Samwick, 1999b; Kedia 2006), mainly due to the difficulty of constructing a proxy that adequately captures firms' strategic conduct, i.e., whether it is competing in strategic substitutes or complements.

I utilize industry-specific financial and operational data for U.S.-based, scheduled passenger airlines to measure the degree of strategic substitutive or complementary interactions among firms. The airline industry provides an ideal setting for such an examination. The airline industry is characterized by both substitutable and complementary firm production outputs due to geographic product market segregation, which makes it possible and reliable to distinguish firms that compete in strategic substitutes from those competing in strategic complements. Also, industry regulation mandates that proprietary information revealing firms' strategic action choices (e.g., production capacity and output by market, detailed operating cost structure, and fare information) be publicly disclosed on a quarterly basis.

I find that, consistent with the prediction of industrial organization theory, pay-for-peer-firm performance sensitivity is negative (positive) and significant when firms compete in strategic substitutes (complements). This finding supports the strategic interaction hypothesis and provides evidence that the effect of accounting performance measures in CEO incentive contracts is influenced by the *type* of strategic competition among firms. Further, consistent with predictions of industrial organization theory, I find that, as the intensity of competition rises, the association between managers' pay and peer-firm performance strengthens relative to the association between managers' pay and own-firm performance. This finding offers further evidence in support of the strategic interaction hypothesis, and indicates that the role of accounting performance measures in CEO incentive contracts is also influenced by the *intensity* of strategic competition among firms.

Contrary to predictions of agency theory, I find that pay-for-peer-firm-performance sensitivity is insignificant when all firms (i.e., both substitutes and complements) are included in the peer group. The absence of the finding predicted by agency theory may be due to the fact that the effects of filtering out common risk and influencing strategic interaction are directionally opposite, and thus cancel each other out when testing for relative performance evaluation using an aggregate performance measure. However, this does not imply that the two RPE effects are mutually exclusive, as industrial organization theory argues. Once I decompose the aggregate performance measure into systematic and unsystematic components, I find evidence that supports firms' use of relative performance evaluation for both strategic and informational objectives. The systematic component best captures the effects of common-industry-wide risk factors on firm performance, while the unsystematic component best captures the effects of strategic behavior on firm performance. I find that firms use the unsystematic component for relative performance evaluation aimed at influencing strategic competition, while the systematic component is employed for relative performance evaluation that is aimed at filtering common noise out of performance measures, thereby *both* motivating strategic behavior and improving the efficiency of incentive contracting.

My study contributes to the literature in three ways. First, I contribute to accounting literature by providing evidence that relative performance evaluation for managerial incentive contracting at the inter-firm level may have benefits additional to those that arise at the intra-firm level. The agency literature (Lazear and Rosen, 1981; Holmstrom 1982, Nalebuff and Stiglitz, 1983) generally focuses on intra-firm settings and argues that linking managerial incentives to relative performance measures has informational advantages. My study provides empirical evidence that, in settings with interdependent owner-manager pairs, linking managerial incentives to relative performance measures may also have strategic advantages. Further, I contribute to Aggarwal and Samwick (1999b) by distinguishing between firms competing in strategic substitutes and strategic complements and by testing in the same sample the effects of both types of strategic competition on the use of RPE in managerial contracts. Accordingly, I find that the same firm rewards its CEO negatively for substitute-peer-group performance and positively for complement-peer-group performance. This result offers empirical evidence showing that the effect of relative performance measures on managerial incentives depends on the type of strategic competition between a firm and its peers.

Second, I create tension between agency theory and industrial organization theory. An important insight of my study is that firms may use aggregate performance measures to address their risk-reduction objectives and disaggregate performance measures for their strategic interaction objectives. Industrial organization theory suggests that in imperfectly competitive settings, the effects of strategic competition and risk reduction on managerial incentives are mutually exclusive and the former dominates the latter – at least in settings where firms compete in strategic complements (Fumas, 1992; Aggarwal and Samwick 1999b). However, the few empirical tests to date do not feature specifications that distinguish between the strategic and informational role of relative performance measures. Thus, the prior empirical literature has been unable to provide evidence either for or against theoretical assertions about the conflict between the uses of RPE for strategic and informational objectives. My study suggests that, although the two objectives have directionally different effects on managerial incentives, they may co-exist in managerial incentive contracts.

Third, I contribute to the empirical literature that examines the relative performance evaluation of managers. Most of the previous RPE empirical literature identifies industry peer groups based on 2-4 digit SIC codes. However, many firms are assigned multiple SIC codes because they operate in multiple industries, thus potentially making the relative measures used in these studies too noisy to provide a precise measure of the common uncertainty that can be removed from firm performance measures (Gibbons and Murphy, 1990; Baker, 2002). Since airlines focus exclusively on air transportation, this industry provides a robust, homogeneous setting for examining the RPE hypothesis.

Section II provides the theoretical motivation for my hypotheses. Section III provides an overview of the data and an outline of the empirical models. Section IV provides the results and discussion of my findings. Section V concludes the paper.

II. Theory and Hypothesis Development

Relative Performance Measurement and Agency Theory

The agency literature generally focuses on settings where one principal delegates authority to many agents in an uncertain environment where it is costly to observe agents' actions and effort levels. Agency theory argues that if the uncertainties facing different agents are correlated to some degree, then relative performance measures contain useful additional information about agents' actions. Linking managerial incentives to relative performance measures thus has informational advantages.

The relative performance evaluation (RPE) literature has its roots in the informativeness principle, which states that including in a compensation contract any performance measure that contains incremental information about the agent's actions can improve the contract's efficiency (Holmstrom, 1979). Lazear and Rosen (1981) analytically show that, when it is less costly to observe agents' relative positions than it is to measure the level of each agent's output directly, rank-order tournaments provide an efficient agent reward mechanism. Holmstrom (1982) analytically shows that rank-order tournaments dominate piece rates only if agents' outputs have a degree of interdependence. Holmstrom argues that RPE improves the efficiency of compensation contracts because it helps to remove costly background noise from agents' performance, and not, as argued in Lazear and Rosen (1981) and Nalebuff and Stiglitz (1983), because it motivates competition among agents. Holmstrom shows analytically that if agents' outcomes are correlated to some degree, optimal compensation is a function of own-performance and average peer-group performance (where peer-group is a group of firms that have correlated outcomes). This gives rise to the weak-form RPE hypothesis, which predicts that pay for peer-firm performance is negative, while pay for own-firm performance is positive. Holmstrom and Milgrom (1987) argue that in a relative performance plan it is optimal to compensate agents only for unsystematic performance, which is defined as the component of an agent's (or a firm's) performance that is uncorrelated with that of other agents (or other firms). This theory gives rise to the strong-form RPE hypothesis, which predicts that pay for unsystematic performance is positive, while pay for systematic performance is not significantly different from zero (Antle and Smith, 1986; Holmstrom and Milgrom, 1987; Janakiraman, Lambert, and Larcker, 1992).

Empirical evidence about the use of relative performance measures in order to filter out noise from performance measures used in compensation contracts is mixed. Studies that find implicit evidence of weak-form RPE in CEO compensation contracts include: Antle and Smith (1986), Gibbons and Murphy (1990), Janakiraman, Lambert and Larcker (1992), Hall and Liebman (1998), Rajgopal, Shevlin and Zamora (2006), and Albuqerque (2009). However, other studies find no evidence of a link between RPE and CEO compensation, including: Jensen and Murphy (1990), Barro and Barro (1990), Joh (1999), Aggarwal and Samwick (1999a/b), Bertrand and Mullainathan (2001), and Garvey and Milbourn (2003 and 2006). Antle and Smith (1986) and Albuquerque (2009) are the sole studies to find evidence of strong-form RPE.

The lack of strong evidence of RPE in the executive compensation literature has motivated a stream of research that investigates potential explanations for the discrepancy between RPE theory and the corresponding empirical evidence (Parrino, 1997; Joh, 1999; Aggarwal and Samwick, 1999a/b; Garvey and Milbourn, 2003; Rajgopal and Shevlin and Zamora, 2006; Albuquerque, 2009). These studies either identify issues with respect to the empirical regularities of the models used in previous RPE research or they find conditions which affect the use of RPE in CEO incentive contracting. This literature finds the following to be contributing factors in the lack of strong evidence of firms' implicit use of RPE: industry concentration, collusion and heterogeneity, managers' outside job opportunities, poor firm governance, the extent to which executives can hedge market risks, and firm size.

Following previous agency literature, I first hypothesize that firms use relative performance measures in CEO compensation in order to filter out common uncertainty, i.e., the weak-form RPE hypothesis:

H1: Pay-for-own-firm-performance sensitivity is <u>positive</u>; pay-for-peer-firm-performance sensitivity is <u>negative</u>.

Further, I hypothesize that in RPE plans firms entirely remove the systematic component of performance (i.e. the component of firm performance that is correlated with peer-group performance) and reward managers only for unsystematic performance as suggested by Holmstrom and Milgrom (1987), i.e., the strong-form RPE hypothesis:

H2: Pay-for-own-firm systematic performance sensitivity is zero; pay-for-own-firm unsystematic performance sensitivity is positive.

Relative Performance Measurement and Industrial Organization Theory

Hypotheses H1 and H2 are based on the informativeness principle from agency theory, which states that including in a compensation contract any performance measure that contains incremental information about the agent's actions (i.e., relative performance information) can improve the contract's efficiency (Holmstrom, 1979). However, agency models do not account for the use of relative performance evaluation to motivate managerial strategic action choices. In settings in which firms are interdependent, owners are concerned about not only intra-firm informational asymmetries, but also inter-firm competition. Owners want to provide incentives to their managers to engage in strategic interaction with the managers of peer firms (Vickers, 1985; Fershtman, 1985). The idea of rewarding own-firm managerial performance relative to that of the firm's peers in order to draw the desired competitive response of peer firms' managers has been a subject of investigation in the industrial organization literature (Fumas 1992; Aggarwal and Samwick, 1999b). The core idea is that linking managerial incentives to relative performance measures can be used to motivate managers to take strategic actions that are observed by peers, thus inducing the desired competitive response.

Analytical models in the 1980's show that rewarding managers strictly based on own-firm profits may not be the most efficient way to maximize own-firm value when interdependencies exist among firms. In a seminal paper, Vickers (1985) shows that when principals (e.g., firm owners) compete in an oligopoly, rewarding their managers based on both own-profits and on own-quantities other than profits (e.g., sales) yields a strategic advantage, which may result in greater profits, as it draws a favorable competitive response. Fershtman (1985) also argues that by designing managerial incentives, owners can determine the kind of competitive decisions their managers will make. These fundamental theory papers are among the first to treat managerial incentives as a strategic variable. Fershtman and Judd (1987) and Sklivas (1987) analytically show that the design of managerial incentive contracts in order to impact competing managers' behavior critically depends on the nature of the competition. In the case of market share competition, they show that each owner wants to motivate its manager toward high production in order to induce competing managers to reduce their output. Hence, owners will provide a positive incentive for sales. In the case of differentiated product/market competition, each owner wants its manager to set a high price, thereby encouraging competing managers to similarly raise their price. Hence, owners will pay managers to keep sales low.[1]

Fumas (1992) incorporates into a single model both the strategic and informational aspects of managerial incentives. His study shows that in oligopolistic settings, firms' use of relative performance measures to evaluate their managers may cause a conflict between the objective of reducing the risk placed on the manager and the implications for strategic competition derived from such performance measures, especially when firms compete in strategic complements (i.e., when more "aggressive" play by one firm raises both firms' marginal profitability).

Aggarwal and Samwick (1999b) develop an extension of Fumas's (1992) analytical model. In the Aggarwal and Samwick (1999b) analytical model, managers' strategic action

[1] Other related theory papers include Katz (1991) and Reitman, (1993).

choices (e.g., output or price choices aimed at influencing competitors' output or price choices) may have a personal cost in the short-term because they reduce short-term profits, and because they are non-contractible by owners.[2] On the other hand, outcomes (e.g., profits, costs, revenues) are contractible and observable. However, non-contractible strategic action choices cannot be perfectly inferred from outcomes due to noisy outcome performance measures. Thus, owners provide their respective managers with incentives designed to influence managers' costly strategic action choices. Aggarwal and Samwick (1999b) analytically show that when firms compete in strategic substitutes, managers' pay is an increasing function of own-firm performance and a decreasing function of peer-firm performance. They attribute this result to the need to motivate managers to compete aggressively rather than the need to filter out noise from managers' performance. They also show that when firms compete in strategic complements, managers' pay is an increasing function of both own-firm and peer-firm performance. They attribute this result to the need to motivate managers to soften their competitive behavior.[3]

The above discussion leads to the following hypotheses:

H3a: Pay-for-peer-firm performance sensitivity is negative when firms compete in strategic substitutes.

H3b: Pay-for-peer-firm performance sensitivity is positive when firms compete in strategic complements.

Note that the positive association between managers' pay and peer-firm performance when firms compete in strategic complements is directly in conflict with agency theory that predicts a negative association. Further, Aggarwal and Samwick (1999b) analytically show that

[2] Strategic action choices (e.g., overproduction in order to gain market share or under-production to raise prices) may reduce profits in the short term, so if managers are evaluated strictly on own-profits, strategic action choices are personally costly.

[3] Their model's predictions are unaffected by standard agency theoretical assumptions regarding agents' risk aversion and effort levels, as well as the nonobservability of own-firm incentive contracts to peer firm managers.

the optimal compensation contract is sensitive to the intensity of competition in the firm's product market. Their model generates the prediction that as the intensity of competition rises, the association between a manager's pay and peer-firm performance strengthens relative to the association between the manager's pay and own-firm performance. In more competitive product markets, managers are given weaker incentives to maximize the value of their own firm and stronger incentives to minimize (maximize) the value of rival (all) firms when firms compete in strategic substitutes (complements).

The above discussion therefore results into the following hypothesis:

H4: As the intensity of competition rises, pay-for-peer-firm performance sensitivity becomes more negative (positive) <u>relative to</u> pay-for-own-firm-performance sensitivity when firms compete in strategic substitutes (complements).

Empirical evidence on the strategic interaction hypothesis is scarce and indirect (Joh, 1999; Aggarwal and Samwick, 1999b; Kedia 2006), mainly due to the difficulty of constructing a reliable proxy that adequately captures firms' strategic conduct, i.e., competition in strategic substitutes or complements. Without distinguishing between strategic substitutes and complements, Joh (1999) and Aggarwal and Samwick (1999b) find evidence of overall positive pay-for-peer-firm-performance sensitivity in Japanese and U.S. firms, respectively. Joh (1999) interprets this result as evidence of overall collusive behavior in Japan. Also, Aggarwal and Samwick (1999b) find that RPE for managerial contracting purposes is used less frequently in more concentrated industries in order to prevent peer-firm managers from engaging in excess competition.[4]

[4] Also, Kedia (2006) tests the Fershtman and Judd (1987) model by defining strategic substitutes and strategic complements according to the methodology of Sundaram, John and John (1996). He finds that firms competing in strategic substitutes reward CEOs to a lesser degree on (own-firm) profit and to a larger degree on (own-firm) sales. The opposite finding holds when firms compete in strategic complements. His study focuses on the emphasis of

III. Research Setting and Data Description

Research Setting, Classification of Strategic Substitutes and Complements, Data Sample

Individual industries have important idiosyncrasies that ultimately affect potential comparisons of the degree of substitution (or market power) (Bresnahan, 1989, p. 1012). Bresnahan posits that institutional detail at the industry level will affect firms' conduct and thus the empirical measurement of market power. I test my research hypotheses by using financial and operational industry-specific data for U.S.-based, scheduled passenger airlines. I operationalize the degree of substitution among firms utilizing institutional detail at the industry level. Scheduled passenger carriers can be assigned to one of two distinct product-market segments, based on geographical segregation − network carriers and regional (commuter) carriers. Network carriers include hub-and-spoke carriers, which operate hub-and-spoke systems, and spoke-to-spoke carriers, which operate out of focus cities offering non-stop flights.[5] Network airlines (whether hub-and-spoke or spoke-to-spoke) operate independent route systems. In contrast, regional airlines typically enter into affiliations with one or more network airlines. According to this affiliation, the regional airline agrees to use its smaller aircraft to carry passengers booked and ticketed by network airlines between a hub/focus city and a smaller outlying city (JetBlue 10-K Report, 2002; Skywest 10-K Report, 2009). Table 1 provides a list of all firms in the sample (both network and regional airlines), grouped by geographical product-market segment.

[Insert Table 1]

Regional and network airlines have complementary route systems, strikingly different

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incentives on own-firm profit relative to own-firm sales, but does not address the influence of strategic competition on the role of relative performance measures in managerial compensation contracts.

[5] Hub-and-spoke carriers include many major airlines, such as American Airlines, United Airlines, and Delta Airlines. Spoke-to-spoke carriers include many low-fare airlines such as Southwest Airlines, Airtran Airways, and JetBlue.

cost structures, and an interdependence that increases throughout the sample period. First, regional carrier route systems serve a complementary function to network carrier route systems by allowing more frequent service, including off-peak-time-of-day departures to smaller cities, and by carrying traffic that connects with network carriers' mainline aircraft (Expressjet 10-K Report, 2003).[6] In addition, the cost structure of a regional carrier is significantly higher than that of a network carrier on a production unit basis, mainly due to shorter average flight segment length and lower average seating capacity. The average length of a flight and average seating capacity are important determinants of an airline's cost structure (Banker and Johnston, 1993).[7] Finally, the share of regional carrier departures at network carrier hubs/focus cities grew from 7.7% in 1992 to 42.0% in 2009, while the share of regional carrier passenger enplanements at network carrier hubs/focus cities grew from 2.1% in 1992 to 21.9% in 2009 (source: Department of Transportation (DOT), schedule T3).

My sample includes the 21 largest regional airlines that are either under code sharing agreements or are wholly-owned subsidiaries of network airlines. These airlines accounted for more than 96% of all regional passenger enplanements in 2005 (Regional Airlines Association, 2006 Annual Report). Arrangements between network and regional airlines (including wholly-owned subsidiaries of network carriers) vary contractually between fixed-fee and revenue-sharing arrangements (American Airlines, Delta Airlines, Skywest, Republic Airways 10-K Reports, 2009). A description of these arrangements is provided in Appendix A.

Regional airlines as a group, including both subsidiaries of and those not owned by

[6] A large number of U.S. airports are served exclusively by regional carriers. According to RAA (Regional Airlines Association), 71% of U.S. airports in 1999, and 73% of them in 2008, only saw regional airline traffic (RAA 2009 Annual Report).

[7] In 1999 (2008), the average flight segment length of a regional carrier was 274 (456) miles, as opposed to a network carrier, which had segment length of 848 (1,052) miles (RAA 2009 Annual Report, DOT schedule T1). The difference also holds true for seating capacity. In 1999 (2008), the average seating capacity of a regional carrier was 39 (54) seats, while a network carrier had 165 (169) seats (RAA 2009 Annual Report, DOT schedule T1).

network airlines, compete in strategic complements with similarly grouped network carriers. Regional airlines that are affiliated with one or more network airlines have complementary route networks both with affiliated network airlines contractually and non-affiliated network airlines geographically.[8] From an incentive standpoint, network carriers have strong incentives to collaborate with and improve the performance of their affiliated regional airlines, e.g., to assist in cost reduction, as a regional airline's costs largely determine its affiliated network carriers' input prices. In turn, regional carriers have strong incentives to cooperate with and improve the performance of their affiliated network airlines. For example, improved on-time performance increases the affiliated network carrier's appeal to passengers, which increases passenger load factors across the system.

Non-affiliated network and regional carriers also have strong incentives to foster cooperation. A network airline wants non-affiliated regional airlines to raise prices, as doing so raises the input costs of the other network airlines with which it directly competes (e.g., a network airline may want to signal its intent to withhold entry to non-affiliated regional airlines' markets, thus softening competition). In turn, a regional airline wants non-affiliated network airlines to raise prices and reduce output across their systems, as doing so raises the production unit costs of the other regional airlines with which it directly competes (e.g., a regional airline may want to signal its intent to withhold entry with its own brand to non-affiliated network airlines' routes, thus softening competition).

Network carriers compete in strategic substitutes with rival network carriers. Due to geographical markets, network carriers' route systems are highly substitutive, as is evident when two network carrier route systems overlap to a large degree. However, even when two network

[8] Since regional carriers predominantly carry commuter passengers between small cities and affiliated network carrier hubs/focus cities, their routes rarely overlap with those of non-affiliated network carriers.

carriers' route systems have only a small degree of overlap or no overlap at all, their route systems are still substitutive, due to connecting flights in network carriers' route systems. From an incentive standpoint, each network carrier wants to gain market share; it thus expands production output aggressively in the short term in order to induce rival network carriers to reduce their production output in the future. As a result, I classify all network carriers in a single group as competing in strategic substitutes.

Regional carriers also compete in strategic substitutes with rival regional carriers, although their route systems rarely overlap to a significant geographic degree. Regional carriers directly compete for contracts for network carrier regional business. Even the regional subsidiaries of network airlines are compared by their parents with non-owned regional airlines in terms of cost and service quality (American Airlines, Delta Airlines, Alaska Airlines 10-K Reports, 2009). From an incentive standpoint, each regional airline wants to gain market share (contracts for network carrier business); it thus expands production output aggressively in the short term to induce rival regional airlines to reduce their production output in the future. As a result, I classify all regional carriers in a single group as competing in strategic substitutes.

Importantly, explicit evidence from airline proxy statements also reveals that network airlines define the group of their direct competitors as exclusively consisting of other network airlines, while regional airlines solely define the group of their direct competitors by other regional airlines (including wholly-owned subsidiaries of network airlines) (American Airlines, Delta Airlines, Expressjet, Skywest 10-K Reports, 2009).

My data consists of firm-year observations for 46 U.S.-based scheduled passenger carriers from 1992 through 2009 (a total of 540 firm-year observations). The subsample of publicly traded firms for which compensation data are available (compensation is the dependent variable of this study) consists of 30 firms and 277 firm-year observations.[9] Based on the data that are available through DOT, I calculate proxies for peer-group performance measures using all airlines with more than $20 million in sales (both publicly traded airlines and those that are not, as well as subsidiaries of network airlines), i.e., 46 firms and 540 firm-year observations. Including information about non-publicly traded peer firms of substantial size results in less noisy proxies of peer-firm performance measures, as publicly traded airlines have access to and make use of the information of their non-publicly traded peers (see Table 1). The dependent variable (compensation) is based only on data of publicly traded firms. Petroni and Safieddine (1999) find a significant positive association between accounting returns (ROA) and executive compensation in publicly traded firms, but find no significant association in non-publicly traded firms. Consistent with contracting theory, their study suggests that CEO compensation of non-publicly traded firms is less based on objective measures such as accounting information and more on subjective measures. Therefore, using the subsample of publicly traded firms in my analysis increases the statistical power of my models.

I obtain data for CEO compensation, CEO characteristics, and firm governance characteristics from the ExecuComp database and from company proxy statements (via hand collection).[10] I obtain data on operating costs and operational statistics, which I use to calculate the average production unit cost (CASM - Cost per Available Seat Mile, the primary proxy for firm performance in this study), product-market competition, and entity-specific control variables from the U.S. Department of Transportation (DOT) carriers' financial and operational statistics including schedules P-12/11, P-6, P-52/51, P10, B43, T1, and T3.[11] I obtain firm-

[9] Firm-year observations in the regression models turn out to be 247 because I use changes specification.
[10] Information for 13 of the 30 publicly traded airlines was found in ExecuComp.
[11] The term 'entity-specific' refers to data at the subsidiary level when an airline has wholly-owned regional airline subsidiaries. Unlike carriers' SEC financial reports, DOT financial reports contain detailed data at the subsidiary

specific financial data from firms' annual reports.[12] The DOT databases contain quarterly airline financial data and operational statistics from the first quarter of 1992 through the fourth quarter of 2009. Table 2, Panel A describes the sample construction. Table 2, Panels B and C contain the frequency of sample observations by firm and year, respectively. Table 2, Panel D presents selected financial information for the subsample of publicly traded firms.

[Insert Table 2]

Measurement of Managerial Incentives

I construct managerial incentives, the dependent variable in this study, as the change in the natural logarithm of total CEO compensation ($\Delta \ln COMP_{it}$). Total compensation includes the CEO's salary, bonus, the value of the stock option portfolio, the value of earned but unvested restricted stock portfolio, and long term (non-equity) incentive payouts (LTIP). I use the value of the CEO's total stock option and restricted stock portfolio, instead of only the value of the annual stock option and restricted stock grants, as incentives from a CEO's existing holdings of options and stock impact the firm's current year compensation structure decision. Core and Guay (1999) show that grants of new incentives from options and restricted stock are negatively related to deviations between the value of a CEO's existing holdings of equity incentives and optimal levels. Hence, firms issue new grants to provide their CEO with incentives, taking into account the value of the CEO's existing stock and stock option holdings.

The value of the stock option portfolio is computed using the Black Scholes option pricing model, as modified by Merton to account for dividend payouts (Black, Scholes, 1973; Merton, 1973). The value of unexercised stock options (granted in previous years) for fiscal

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level and separately itemize all non-air-transport-related expenses and revenues. This allows for the construction of finer firm performance proxies for benchmarking objectives.

[12] The term 'firm-specific' refers to data at the corporate (parent) level. These data are used for the calculation of ROA, as well as the financial leverage and book-to-market ratios.

years prior to SFAS 123 implementation is computed using the approximation method suggested in Core and Guay (2002). Using the natural logarithm of total compensation mitigates heteroskedasticity and other problems resulting from skewness and extreme observations (Wooldridge, 2006, p.198-9), and facilitates a comparison with previous studies (Murphy, 1999). I use differences-in-differences specification to control for the effects on CEO compensation of unobserved, firm-specific factors that remain relatively unchanged over time (Wooldridge, 2006, p. 491-2).

Measurement of Own-Firm and Peer-Firm Performance

I measure firm performance as the change in the natural logarithm of a firm's average production unit cost, CASM for two reasons. First, the premise of hypotheses H3a/b is that firms provide incentives to motivate managers to take actions that are non-profit maximizing in the short term but are value maximizing in the long term, in order to deter rivals when firms compete in strategic substitutes and to foster cooperation with peers when firms compete in strategic complements. Therefore, relative performance measures that are intended to influence strategic interaction must capture the short-term effects of managers' strategic actions. I argue that CASM (a disaggregate measure) captures the short-term effects of strategic actions in the airline industry better than aggregate measures such as ROA or stock returns do. An airline's production output choices have an immediate effect on its production unit cost (CASM). Because many airline costs are fixed with respective city-pair markets, average CASM declines (increases) dramatically as the number of flights in a given city-pair market increases (declines) (Caves, Christensen, and Tretheway, 1984). The same effect occurs with respect to the average revenue per unit (RASM). Hence, the short term effects of production output choices on costs and revenues approximately offset each other and the net effect on ROA is small or negligible.

Therefore, ROA is an ineffective performance measure for strategic managerial incentive schemes.

Second, own-CASM is used by boards of directors in managerial incentive contracting both explicitly and subjectively, as well as relative to peer group CASM (see Appendix B). CASM is also one of the most important measures used by airline executives and boards of directors in assessing quarterly and annual cost performance, and it is commonly used by Wall Street analysts as the basis by which they compare airlines (Alaska Airlines 10-K Report, 2009). For example, comparisons of CASM among carriers abound in airline financial reports, in airline presentations to the media and the investment community, and in Wall Street analyst reports .[13] CASM is also the basis on which regional and network carriers transact in capacity purchase transactions. Francis, Humphreys, and Fry (2005) conduct a survey of senior executives from the world's 200 largest airlines. They find that CASM is used by 90% of respondents and ranks as the most useful measure in the operational performance measure category. In addition, detailed operating cost data and production output data are reported quarterly to the DOT on a segment reporting basis, in accordance with regulations; these data are made available to the public.

In my tests of hypotheses H3a/b and H4 (the strategic interaction hypotheses), I use the change in the natural logarithm of CASM as the proxy for firm performance ($\Delta \ln CASM_{it}$). It should be noted, however, that aggregate performance measures such as ROA may best capture common, industry-wide risk factors and may thus be well-suited for proxies of firm performance in tests of the RPE hypothesis. To maintain consistency with previous RPE research in accounting, I use both the change in ROA (ΔROA_{it}) and the change in the natural logarithm of CASM ($\Delta \ln CASM_{it}$) in my tests of hypotheses H1 and H2 (the relative performance evaluation

[13] CASM excludes the effects of cash flow hedges, as by DOT rules gains/losses from derivative contracts are reported in non-operating income.

hypotheses). The numerator in CASM (total operating cost) includes all operating costs while excluding operating-lease-financing costs and transport-related costs.[14] Including transport-related expenses would greatly and unequally overstate airlines' average production unit costs (Tsoukalas, Belobaba, and Swelbar, 2008).[15] Consistent with previous RPE literature (Albuquerque, 2009), I calculate ROA as the natural logarithm of 1 plus the ratio of net income excluding income from discontinued operations and extraordinary items to total assets, including capitalized operating leases.[16]

I measure a firm's substitute-peer-group performance as the change in the natural logarithm of the average CASM of the group of airlines which compete in strategic substitutes with the firm (excluding the same firm) ($\Delta lnSUBS\_CASM_{it}$). Similarly, I measure a firm's complement-peer-group performance as the change in the natural logarithm of the average CASM of the group of airlines which compete in strategic complements with the firm ($\Delta lnCOMPL\_CASM_{it}$). The average peer group production unit costs, $SUBS\_CASM_{it}$ and $COMPL\_CASM_{it}$, are weighted by firm size (ASMs). The weighted average is appropriate because the strategic actions (e.g., production output and price choices) of larger competitors have a more profound impact on the industry than do the actions of smaller competitors. Hypotheses H3a/b predict a positive association between $\Delta lnCOMP_{it}$ and $\Delta lnSUBS\_CASM_{it}$, and a negative association between $\Delta lnCOMP_{it}$ and $\Delta lnCOMPL\_CASM_{it}$.

In my tests of the relative performance evaluation hypothesis, I measure peer-firm

[14] As operating leases are the off-balance-sheet rentals of aircraft, buildings and equipment, the implied interest component is not an operating cost and must be removed in order to ensure a fair comparison among airlines with different amounts of on- and off-balance sheet assets and liabilities. I use the conventional rule of estimating the implied interest on operating leases in the airline industry by multiplying the total annual rentals by 1/3 (W. Greene, Morgan Stanley Equity Research, 2008 and 2009).
[15] Transport-related expenses predominantly include fees paid to other airlines under capacity-purchase and code-sharing agreements where the capacity (ASMs) purchased is reported only by the operating carrier.
[16] I use the conventional rule of capitalizing operating leases in the airline industry by multiplying the total annual rentals by 7 (W. Greene, Morgan Stanley Equity Research, 2008 and 2009).

performance as the change in the natural logarithm of the average CASM of the total group of airlines in the sample excepting the same firm (i.e., both substitutes and complements are included in the calculation of the average) ($\Delta lnPEER\_CASM_{it}$). I also measure peer-firm performance as the change in the average ROA of the total group of airlines in the sample excluding the same firm ($\Delta PEER\_ROA_{it}$). Hypothesis H1 predicts a positive association between $\Delta lnCOMP_{it}$ and ΔROA_{it} and a negative association between $\Delta lnCOMP_{it}$ and $\Delta PEER\_ROA_{it}$. Because CASM is inversely related to performance, H1 predicts a negative association between $\Delta lnCOMP_{it}$ and $\Delta lnCASM_{it}$, and a positive association between $\Delta lnCOMP_{it}$ and $\Delta lnPEER\_CASM_{it}$.

Measurement of the Intensity of Competition

Consistent with prior research (Joh, 1999; Aggarwal and Samwick, 1999b), I first construct a measure of product-market concentration based on the Herfindahl-Hirschman Index (HHI) (Schmalensee, 1989, p. 966). I calculate the HHI of an airline's product markets as the sum of competitors' squared *combined* market shares in the airline's hubs/focus cities (including the same airline) in the following manner:

$$HHI_K = \sum_{i=1}^{I} \left(\frac{\sum_{j=1}^{J} d_{ij}}{\sum_{j=1}^{J} D_j} \right)^2 ,$$

where i=1, ..., I, denotes the number of airlines that fly out of the K-th airline's hubs/focus cities; j=1,....,J, denotes the number of the K-th airline's hubs/focus cities; d_{ij} denotes the number of the i-th airline's departures out of the j-th airport; and Dj denotes total departures of scheduled passenger (network and regional) airlines at the j-th airport. A hub/focus city is defined as an airport in which at least 2% of the K-th airline's departures originate.

Second, the Department of Justice (DOJ) defines market concentration (DOJ Horizontal Merger Guidelines § 1.51, 1992, revised 1997) as follows:

if HHI <= 10%, the market is unconcentrated

if 10% < HHI <= 18%, the market is moderately concentrated

if HHI > 18%, the market is concentrated.

I construct an indicator variable that captures the degree of concentration in an airline's product markets based on the Department of Justice definition, as follows:

$CONCENTRATED_{it}$ = 1 if HHI > 18% and = 0 if HHI <= 18%.

The variable $CONCENTRATED_{it}$ is negatively related to the intensity of competition since higher (lower) product-market concentration is related to lower (higher) product-market competition.

To make the interpretation of the results easier, I define an alternative indicator variable, $COMPETITION_{it}$, that is inversely related to $CONCENTRATED_{it}$, as follows:

$COMPETITION_{it}$ = 1 if HHI <= 18% and = 0 if HHI > 18%.

Hypothesis H4 predicts that $ABS[\Delta lnSUBS\_CASM_{it} + COMPETITION_{it} \times \Delta lnSUBS\_CASM_{it}] > ABS[\Delta lnCASM_{it} + COMPETITION_{it} \times \Delta lnCASM_{it}]$, and $ABS[\Delta lnCOMPL\_CASM_{it} + COMPETITION_{it} \times \Delta lnCOMPL\_CASM_{it}] > ABS[\Delta lnCASM_{it} + COMPETITION_{it} \times \Delta lnCASM_{it}]$, where ABS is the abbreviation for the absolute value.

Control Variables

I control for a number of variables that are likely to be associated either with managerial incentives exclusively or both managerial incentives and an airline's cost structure. These variables include CEO-specific, firm-governance, and airline-specific variables. I use levels specification when a variable does not change significantly year over year; otherwise I use changes. Variable definitions and predicted associations from the previous literature are presented in Appendix C. Descriptive statistics for the total sample (both network and regional airlines) are presented in Table 3, Panel A. Table 3, Panels B and C present separate descriptive statistics for network and regional airlines, respectively. Table 4, Panel A presents the correlation matrix for the variables used to test the strategic interaction hypotheses. Table 4, Panel B presents the correlation matrix for the variables used to test the RPE hypotheses.

[Insert Tables 3, 4]

IV. Results and Discussion

Tests of the Relative Performance Evaluation Hypotheses (H1 and H2)

To test hypothesis H1 (weak-form RPE hypothesis), I estimate the following empirical model:

$$\Delta lnCOMP_{it} = \beta 0 + \beta 1\ \Delta ln[PERF]_{it} + \beta 2\ \Delta lnPEER\_[PERF]_{it} + \langle control\ variables \rangle + $$

$$+ \langle year\ indicators \rangle + \varepsilon_{it}, \qquad (1)$$

where [PERF] is CASM or ROA. Hypothesis H1 predicts negative values for $\beta 1$ and positive values for $\beta 2$ in equation (1) when PERF is CASM (because lower values of CASM indicate higher performance), and positive values for $\beta 1$ and negative values for $\beta 2$ in equation (1) when PERF is ROA. Albuquerque (2009) finds that grouping peer firms by both industry and size is important in RPE tests because firms of similar size experience similar external shocks and respond to these shocks with similar flexibility. Therefore, I split my sample into quartiles in terms of revenue and recalculate the peer-group average performance measures $\Delta lnPEER\_CASM_{it}$ and $\Delta lnPEER\_ROA_{it}$ for each quartile separately (for the tests of the RPE hypotheses only). I estimate equation (1) and all subsequent models using OLS with pooled data and adjust for inflated t-statistics according to Froot's (1989) robust standard errors with firm-level clustering to compute p-values.

The results of the estimation are presented in Table 5. The adjusted R^2 of the model with CASM (Model 1) is 7.9%; that of the model with ROA (Model 2) is 8.3% (all VIFs < 2.5 in both models). Consistent with H1, the coefficient on own-firm performance is negative in the model with CASM and positive in the model with ROA (coefficients of -.939 and 2.320; one-tailed p<.01 for both). Changes in compensation are strongly and positively associated with changes in own-firm performance. However, inconsistent with H1, pay-for-peer-firm-performance sensitivity has the opposite from the predicted sign in Model 1 and is statistically insignificant in both models. This evidence provides no support for the weak-form RPE hypothesis.[17]

[Insert Table 5]

Next I test hypothesis H2 (strong-form RPE hypothesis) (Holmstrom, 1982; 1987), following the methodology proposed by Antle and Smith (1986).[18] The strong-form RPE test is performed in two stages. In the first stage, I regress own-firm performance on average peer-firm performance and obtain the estimated co-efficients using the following model:

$$\Delta \ln[PERF]_{it} = \lambda + \rho\ \Delta \ln PEER\_[PERF]_{it} + \eta_{it} \qquad (2A)$$

I construct estimates of systematic and unsystematic firm performance as follows:

$SYS\_[PERF]_{it} = \hat{\lambda} + \hat{\rho}\ \Delta \ln PEER\_[PERF]_{it}$, and $UNSYS\_[PERF]_{it} = \hat{\eta}_{it}$,

where $SYS\_[PERF]_{it}$ is the systematic firm performance and $UNSYS\_[PERF]_{it}$ is the unsystematic firm performance. Then I use the estimates of systematic and unsystematic performance in the second stage regression (the compensation regression) according to the following model:

[17] In untabulated results, I test the same models: (a) without grouping by size, (b) using levels specification instead of changes, and (c) using stock returns and change in shareholder wealth as proxies for firm performance. The results are qualitatively similar in every case.

[18] Albuquerque (2009) also employs the same methodology to perform a test of the strong-form RPE hypothesis.

$$\Delta \ln COMP_{it} = \beta 0 + \beta 1\ \Delta SYS\_[PERF]_{it} + \beta 2\ \Delta UNSYS\_[PERF]_{it} + <\text{control variables}> + <\text{year indicators}> + \varepsilon_{it}. \quad (2B)$$

Hypothesis H2 predicts that in equation (2B), β1 would not be significantly different from zero, while β2 would be negative when PERF is CASM, and positive when PERF is ROA. The results of the second stage regression are presented in Table 6, Models 1 and 2. The adjusted R^2 of the model with CASM (Model 1) is 8.2%; that of the model with ROA (Model 2) is 8.3% (all VIFs < 2.5 in both models). Consistent with H2, pay-for-systematic-performance sensitivity is not significantly different from zero, while pay-for-unsystematic performance sensitivity is negative in the model with CASM and positive in the model with ROA (coefficients of -.818 and 2.320; one-tailed $p<.01$ for both). This finding provides strong evidence in support of the strong-form RPE hypothesis and suggests that firms implicitly remove the optimal amount of noise from performance measures used in executive compensation contracts (Holmstrom, 1987).

An advantage of the research setting in this study is that I am able to uniquely measure a large source of systematic performance; namely, the effect of jet fuel price volatility. As Appendix B shows, there is ample evidence that airlines explicitly remove the fuel expense component of CASM in all cases where CASM is used to evaluate CEO performance.[19] Holmstrom (1982) notes that "if we knew the exogenous shock ex post, this common uncertainty could and should be filtered away to yield an improved solution to the agency problem". As an additional test of H2, I calculate fuel CASM ($FUEL\_CASM_{it}$) by dividing fuel expenses by ASMs, and non-fuel CASM ($EXFUEL\_CASM_{it}$) by dividing total operating costs excluding fuel expenses by ASMs. I estimate equation (2B) again using $\Delta \ln FUEL\_CASM_{it}$ as the systematic

[19] Fuel expense is one of the most volatile components of an airline's operating costs, earnings, and cash flow. Average fuel expense per annum (calculated cross-sectionally) as a percentage of total operating expense varies in my sample from a low of 11.0% in 1998 to a high of 32.4% in 2008.

component of CASM performance and $\Delta lnEXFUEL\_CASM_{it}$ as the unsystematic component. The results are presented in Table 6, Model 3. The adjusted R^2 of Model 3 is 8.5% (all VIFs < 3.6). Consistent with H2, pay for fuel-CASM performance is not significantly different from zero, while pay for non-fuel-CASM performance is negative (coefficient of -1.481; one-tailed $p<.05$). This evidence confirms that firms explicitly remove the effects of exogenous shocks known ex post from performance measures used in compensation contracts. However, when the effects of exogenous shocks are unknown ex post, firms remove them implicitly from performance measures by evaluating managerial performance on a relative basis (hence, the support that I find for the strong-form RPE hypothesis).

[Insert Table 6]

Tests of the Strategic Interaction Hypotheses (H3a/H3b and H4)

Hypotheses H3a and H3b hypothesize a strategic role for pay-for-peer-firm-performance in addition to an information role predicted by H1 and H2. To test hypotheses H3a and H3b, I estimate the following empirical model:[20]

$$\Delta lnCOMP_{it} = \beta0 + \beta1\ \Delta lnCASM_{it} + \beta2\ \Delta lnSUBS\_CASM_{it} + \beta3\ \Delta lnCOMPL\_CASM_{it} + \\ + \langle\text{control variables}\rangle + \langle\text{year indicators}\rangle + \varepsilon_{it} \qquad (3)$$

Because CASM is inversely related to performance, hypotheses H3a and H3b predict negative values for $\beta1$ and $\beta3$ and positive values for $\beta2$.

The results of the estimation are presented in Table 7, Models 1-3. Model 1 shows the estimation of equation (3) omitting the complementary peer group (i.e., omitting $\Delta lnCOMPL\_CASM_{it}$). Model 2 shows the estimation of equation (3) omitting the substitutive peer group (i.e., omitting $\Delta lnSUBS\_CASM_{it}$). Model 3 shows the estimation of the full model of

[20] I use only CASM in this analysis and not ROA because CASM captures better the short-term effects of managerial strategic actions than ROA.

equation (3). In Models 1, 2, and 3 the adjusted R^2 is 9.7%, 9.4%, and 9.8%, respectively (all VIFs < 3.8 in Models 1 and 2 and < 4.6 in Model 3). Pay-for-own-firm-performance sensitivity is negative in all three models (coefficients of -.711, -1.017, and -.833; one-tailed p<.05 in Model 1, and <.01 in Models 2 and 3). Consistent with H3a, β2 is positive indicating that pay-for-peer-firm-performance sensitivity is negative when firms compete in strategic substitutes (Models 1 and 3) (coefficients of 5.728, and 4.330; one-tailed p<.01, and <.05, respectively). Also, consistent with H3b, β3 is negative, indicating that pay-for-peer-firm-performance sensitivity is positive when firms compete in strategic complements (Models 2 and 3) (coefficients of -4.637 and -2.983, one-tailed p<.01 for both). Hence, the data offer strong support for hypotheses H3a and H3b.

[Insert Table 7]

To test hypothesis H4, I estimate the following empirical model:

$$\Delta \text{lnCOMP}_{it} = \beta 0 + \beta 1\ \Delta \text{lnCASM}_{it} + \beta 2\ \Delta \text{lnSUBS\_CASM}_{it} + \beta 3\ \Delta \text{lnCOMPL\_CASM}_{it} + \\ + \beta 4\ \text{COMPETITION}_{it} + \beta 5\ \text{COMPETITION}_{it} \times \Delta \text{lnCASM}_{it} + \beta 6\ \text{COMPETITION}_{it} \times \\ \times \Delta \text{lnSUBS\_CASM}_{it} + \beta 7\ \text{COMPETITION}_{it} \times \Delta \text{lnCOMPL\_CASM}_{it} + \text{<control variables>} + \\ \text{<year indicators>} + \varepsilon_{it} \qquad (4)$$

Hypothesis H4 predicts that ABS(β2 + β6) > ABS(β1 + β5), and ABS(β3 + β7) > ABS(β1 + β5). I mean-center the interacted variables in equation (3) to reduce multi-collinearity (Jaccard and Turrisi, 2003, pg. 27-28).

The results of the estimation are presented in Table 7, Model 4. The adjusted R^2 is 8.7% (all VIFs < 5.0). The main effects of $\Delta \text{lnCASM}_{it}$, $\Delta \text{lnSUBS\_CASM}_{it}$, and $\Delta \text{lnCOMPL\_CASM}_{it}$ remain significant (coefficients of -.922, 5.675, and -3.553; one-tailed p<.10, <.05 and <.01, respectively). The interactions of COMPETITION_{it} with $\Delta \text{lnCASM}_{it}$ and $\Delta \text{lnSUBS\_CASM}_{it}$ are positive (co-efficients of .266, insignificant; 4.527, one-tailed p<.10), and the interaction of $COMPETITION_{it}$ with $\Delta lnCOMPL\_CASM_{it}$ is negative (coefficient of -2.272; marginally insignificant). I perform F-tests of the differences in absolute values ABS(β2 + β6) - ABS(β1 + β5) > 0, and ABS(β3 + β7) - ABS(β1 + β5) > 0. The F-statistics are 2.97 and 3.41; both are significant at the 5% level (Prob > F = 4.79% and 3.77%, respectively). Hence, the data suggest strong support for hypothesis H4. As product-market competition intensifies (i.e., as product-market concentration diminishes), the pay-for-peer-firm-performance sensitivity increases as predicted (both for strategic substitutes and strategic complements in absolute terms) relative to pay-for-own-firm-performance sensitivity.

Supplemental Analysis for Hypotheses H1 and H3a/b

The evidence from the tests of hypotheses H3a/b provides an explanation for the lack of support for the weak-form RPE hypothesis (H1) that relates to the empirical specification of equation (1). If firms use relative performance measures to influence strategic competition, as the results of the tests of hypotheses H3a/b suggest, then equation (1) is misspecified. Since the effects of relative performance measures on managerial incentives are directionally opposite depending on whether the peer group is defined as strategic substitutes (negative sensitivity) or complements (positive sensitivity), the net effect will likely not be significantly different from zero. That is, offsetting positive and negative sensitivities could lead to an overall insignificant sensitivity to peer performance in equation (1). In addition, neither the specification in equation (1) nor in equation (3) can rule out the possibility that relative performance measures are used both for reducing the risk placed on the manager and for influencing strategic interaction. The use of pay-for-peer-firm-performance sensitivity for risk-reduction objectives is not mutually exclusive with its use for strategic objectives; in fact, the two objectives may be separately observed if an alternative empirical specification is adopted.

The systematic component of performance is useless for the objective of influencing strategic interaction because it cannot be manipulated by managers (e.g., managers have no control over commodity prices, geopolitical risks, volatility in macro-economic output and foreign exchange rates). Therefore, if firms use relative performance measures to influence strategic interaction, they must use the unsystematic component of relative performance. I test this assertion using the following model:

$$\Delta \text{lnCOMP}_{it} = \beta 0 + \beta 1\ \Delta[\text{PERF}]_{it} + \beta 2\ \Delta\text{SUBS\_[PERF]}_{it} + \beta 3\ \Delta\text{COMPL\_[PERF]}_{it} + \\ + \langle\text{control variables}\rangle + \langle\text{year indicators}\rangle + \varepsilon_{it}, \qquad (5)$$

where [PERF] is UNSYS_CASM or EXFUEL_CASM. Hypotheses H3a and H3b predict positive values for β2 and negative values for β3. The results of the estimation are presented in Table 8, Models 1-4. The adjusted R^2 of the models with UNSYS_CASM (Models 1-2) is 9.0% and 9.2%, respectively (all VIFs < 2.5 in both models). The adjusted R^2 of the models with EXFUEL_CASM (Models 3-4) is 9.0% and 10.4%, respectively (all VIFs < 2.6 in Model 1 and < 5.8 in Model 4). Consistent with H3a, pay-for-unsystematic-peer-firm-performance sensitivity is negative (i.e., β2 is positive) when firms compete in strategic substitutes (Models 1 and 3) (coefficients of 3.841 and 3.582; one-tailed $p<.10$ for both). Also, consistent with H3b, pay-for-unsystematic-peer-firm-performance sensitivity is positive (i.e., β3 is negative) when firms compete in strategic complements (Models 2 and 4) (coefficients of -4.499 and -5.944; one-tailed $p<.10$, and $<.01$, respectively).

[Insert Table 8]

Hence, the supplemental analysis suggests that firms filter out noise from performance measures used in executive compensation, and use the unsystematic component to influence strategic interaction. Therefore, it is possible that the failure to find a significant effect in weak-form hypothesis H1 in this and prior studies is that the RPE effects of filtering out common risk and influencing strategic interaction are directionally opposite and cancel each other out when a single aggregate performance measure (e.g., Total CASM) is used. However, this does not imply that the two hypothesized RPE effects are mutually exclusive. Once I decompose the aggregate performance measure into the component that best captures common risk (SYS_CASM or FUEL_CASM) and the component that best captures strategic interaction (UNSYS_CASM or EXFUEL_CASM), both the risk-reduction and strategic effects are evident. The results of the supplemental analysis therefore suggest that firms' use of relative performance measures in order to influence strategic interaction with peer firms is independent of the noisiness of own-firm performance measures.

V. Conclusion

This study examines whether firm owners use relative performance measures in managerial incentive contracting both in order to reduce the risk placed on their managers and to manipulate the competitive behavior of peer firms' managers. Agency theory commonly serves to explain the use of relative performance measures in managerial incentive contracts in order to resolve agency problems between a firm's owner and manager. However, industrial organization theory posits that when the firm's owner competes with counterparts at other firms, relative performance measures in managerial incentive contracts take on the additional role of influencing the competitive response of managers of other firms.

A firm uses pay-for-peer-firm-performance sensitivity to induce peer firm managers to function cooperatively. Therefore, in a setting with interdependent owner-manager pairs, relative performance measures offer strategic as well as informational advantages. However, industrial organization theory argues that the strategic and informational effects of relative performance measures may conflict, especially when firms compete in strategic complements. These effects are thus mutually exclusive, at least in some settings. When firms compete in strategic complements, Aggarwal and Samwick (1999b) analytically show that shareholders would be worse off if firms filtered out industry-wide effects, as doing so would provide managers with an incentive to lower industry-wide returns by engaging in excessive competition, which would, in turn, lower profits. Hence, agency theory provides an incomplete explanation of the incentive uses of relative performance measures in managerial contracts.

I examine the research questions of this study using financial and operational data for U.S.-based scheduled passenger airlines. I find strong support for the strong-form RPE hypothesis using both CASM and ROA as proxies for firm performance. I also find strong support for the strategic interaction hypothesis as predicted by industrial organization theory. However, I find no support for the weak-form relative performance evaluation hypothesis predicted by agency theory. The lack of support for the weak-form RPE hypothesis may be due to the fact that the effects of relative performance on managerial incentives are directionally opposite depending on the type of strategic interaction, thus they cancel each other in aggregate. Finally, the two hypothesized RPE effects – reducing the risk placed on the manager and influencing the strategic behavior of peer-firm managers – may not be mutually exclusive. I find that firms remove systematic risks from performance measures used in incentive contracting, and employ the unsystematic component to influence strategic interaction.

My research offers important insight into the strategic effects of accounting variables, a research area overlooked by prior accounting literature. While previous studies extensively research agency theoretical predictions on the incentive use of relative performance measures in managerial contracts, they overlook the influence of competitive dynamics in imperfectly competitive settings. While it is possible that in intra-firm settings, the area of primary focus for agency theory, relative performance measures have only informational effects, industrial organization theory shows that relative performance measures have strategic effects in inter-firm settings. The strategic interaction hypothesis significantly expands the role of accounting information in managerial incentive contracting. The role of accounting performance measures in managerial incentive contracts is influenced not only by the need to mitigate the effects of informational asymmetries between a firm's owner and managers, but also by the need to commit a firm's managers to strategic behavior in the product market. However, not only may the objectives of risk-reduction and strategic interaction not conflict as previous research argues, they may, in fact, be compatible. My research offers evidence that, when seeking to improve the efficiency of managerial contracts, firms may take advantage of performance measures that are different from those they use to influence managers' competitive behavior.

APPENDIX A
Network-Regional Airline Arrangements

Affiliations between network and regional airlines include fixed-fee and revenue-sharing arrangements. However, most arrangements between regional airlines and network airlines are either fixed-fee arrangements or they contain a form of fixed payment in addition to revenue sharing. Under a fixed-fee arrangement, a network airline schedules flights in regional markets, sells tickets for a contracted regional airline's flights, and collects and retains all regional flying revenue. The network airline generally pays the regional airline a fixed fee for each departure or for each ASM (Available Seat Mile) produced, guarantees payment for a minimum number of departures or ASMs, and offers additional incentives based on flight completion, on-time performance and baggage handling performance[21]. In addition, network and regional airlines often enter into an arrangement in which the network airline bears the risk of changes in the price of fuel; other input costs may also be passed through to the network airline. Under fixed-fee arrangements, regional airlines are sheltered from most of the elements that cause short-term volatility in airline earnings, including variations in ticket prices, passenger loads and fuel prices.

However, fixed-fee arrangements do not shelter regional airlines from prolonged volatility in input costs, final demand and fares. For instance, network carriers pass on to consumers any additional costs of fuel that are not the result of temporary variations in price. This practice effectively raises ticket prices and causes a decline in final demand. Regional airlines must absorb the effect of this decline in final demand for the network carrier's mainline capacity, as demand for regional capacity declines almost proportionately. In addition, as capacity declines, the regional airline's per unit cost rises, even though its per unit price remains fixed by the contract.

Also, due to its dependence on a small number of network airlines, a regional airline is faced with additional risks should one or more of its network airline partners fail to fulfill their obligations due to financial distress. For example, as several large network carriers filed for bankruptcy protection in the years following the 9/11 terrorist attacks, some of their diversified and financially healthier regional partners contributed distressed financing both in the form of debt and equity (Regional News, Air Transport World, 2005)[22]. Other, less diversified, regional airlines filed for bankruptcy[23]. Hence, regional airlines in fixed-fee arrangements are exposed to the same risks as those faced by network airlines.

The second type of affiliation between a regional and a network airline is a revenue-sharing arrangement. Under a revenue-sharing arrangement, a network airline and a regional airline negotiate a proration formula, in which the regional airline receives a percentage of ticket revenues for passengers who are making one portion of their trip on the regional airline and another portion on the network airline (Skywest 10-K Report, 2009; Republic Airways 10-K

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[21] One ASM equals one seat on a plane times one mile flown. One ASM represents the unit of production in the airline industry.

[22] For instance, in 2005, Air Wisconsin and Republic Airways each invested more than $100 million in the financially distressed US Airways; Mesa Air Group invested $30 million in financially distressed Delta Airlines and assumed leases on 30 aircraft.

[23] For instance, Mesaba, which has provided the bulk of its regional service to Northwest Airlines since its inception, filed for bankruptcy protection less than a month after Northwest's bankruptcy filing in 2005. Mesaba's March, 2006 annual report explicitly attributes its bankruptcy filing to the bankruptcy of Northwest Airlines, (which both drastically reduced regional flying and caused Northwest to miss $30 million in payments to Mesaba).

Report, 2009). All substantial costs associated with the regional flight are borne by the regional airline.

A minority of regional airlines are wholly-owned subsidiaries of network airlines[24]. Regional airlines that are subsidiaries of network carriers provide regional services to both their parent and to other network carriers. Also, network airlines that wholly own regional subsidiaries contract with non-owned regional airlines. For DOT reporting purposes and from an operational standpoint, wholly-owned regional subsidiaries are treated by their parent carriers as separate entities. Network carriers contract with their regional subsidiaries in the same manner they do with non-owned regional airlines: via fixed-fee arrangements at the market rates received by other regional carriers for similar flying (American Airlines, Delta Airlines, Alaska Airlines 10-K Reports, 2009). Finally, a few regional airlines are independent. These small-size commuter airlines are not included in the sample of this study.

[24] E.g., for most or all of the sample period, American Eagle and Executive Airlines are subsidiaries of American Airlines, Comair is a subsidiary of Delta Airlines, Horizon Air is a subsidiary of Alaska Airlines, and Continental Micronesia is a subsidiary of Continental Airlines.

APPENDIX B
Evidence of the Explicit, Subjective,
and Relative Uses of CASM in Airline CEO Compensation Contracts

A. Evidence From Proxy Statements (emphasis mine)

1) US Airways places a *10% weight on CASM, excluding fuel expenses and profit sharing* (targeted at 3 explicit numerical levels: threshold, target, maximum) in its determination of annual cash incentive awards. They place 60% overall weight on financial (aggregate, profit-based) and stock performance, and 40% on operating performance (CASM is considered part of operating performance metrics).

US Airways has also "established four operational performance targets based on *relative* mainline on-time flight performance, year-over-year improvements for baggage handling and customer complaints and *cost management*. The first three elements are key customer service metrics measured and reported by the U.S. Department of Transportation, or DOT, and the fourth, cost management, is an important indicator of financial performance that is subject to the control of our management team". The airline also defines the peer group relative to which its cost management performance is measured. Source: US Airways 2009 Proxy Statement.

2) Hawaiian Airlines places a *20% weight on "Cost per Available Seat Mile—Fuel Adjusted (CASM)" (also provides a target level)* in its corporate financial performance goals for determining executive compensation.

Hawaiian Airlines also states that "we consider in making compensation decisions ..., revenue per available seat mile ("RASM") relative to objectives, *cost per available seat mile ("CASM") relative to objectives, RASM growth minus CASM growth relative to a peer group".* The airline also defines the other airlines that comprise the "peer group". Source: Hawaiian Airlines 2009 Proxy Statement.

3) Jetblue places a *20% weight on "CASM (cost per available seat mile) excluding fuel"* (also provides the targeted vs. actual levels) in its annual incentive and equity compensation awards. Source: Jetblue 2009 Proxy Statement.

4) Airtran Airways places a 20% weight on "non-fuel CASM" (also provides target levels). Source: Airtran Holdings 2009 Proxy Statement.

5) Alaska Airlines places a *10% weight on "CASM ex fuel and special items (cost per available seat mile)"* in its performance-based pay metrics.

Alaska Airlines states: "The CASM, excluding fuel and special items, metric was chosen to promote the Company’s progress on its strategic plan". Alaska Airlines 2009 Proxy Statement.

6) Republic Airways states that "The financial data that we take into account in setting our executive officers' compensation includes our operating revenues, pre-tax profit, pre-tax margin, net income and the *cost per available seat mile excluding fuel"*.

Republic Airways also identifies 10 categories of performance criteria (to be chosen *subjectively*) which provide the basis for its annual performance-based awards. One of the categories is defined precisely as: "Cost measures, (including, but not limited to, cost per available seat mile)". Source: Republic Airways 2009 Proxy Statement.

7) Skywest Airlines provides a long list of performance criteria which form the basis of the annual grants it awards (to be chosen *subjectively*). One of the criteria is "*cost per available seat mile*". Source: Skywest Airlines 2009 Proxy Statement.

8) Expressjet defines a long list of performance metrics for the determination of annual awards (to be chosen *subjectively*) including "reductions in costs". Source: Expressjet 2008 Proxy Statement.

9) Continental Airlines specifies a long list of performance measures to be used *subjectively*, including: "any operational or financial performance measure or metric with respect to the company or any business unit or operational level within the company". Source: Continental Airlines 2009 Proxy Statement.

10) Delta Airlines places 37.5% weight on "operational measures that support strategic focus on efficiency and customer focus". Source: Delta Airlines 2008 Proxy Statement.

11) Southwest Airlines *subjectively* uses five performance criteria in determining incentive bonuses including "The Company's significant outperformance of the industry in areas such as unit revenues, on-time performance, and customer service". Source: Southwest Airlines 2009 Proxy Statement.

* Generally, the largest carriers (e.g., American, United, Continental, Delta, Southwest) do not specifically tie compensation to CASM or they do not say that they do and do so subjectively.

B. Evidence From 10-K Reports (emphasis mine)

1) Alaska Airlines provides a detailed reconciliation between CASM and CASM excluding fuel expenses and special items.

"We have listed separately our fuel costs, new pilot contract transition costs, fleet transition charges and restructuring charges per ASM and our unit cost excluding these items. These amounts are included in CASM, but *for internal purposes we consistently use unit cost metrics that exclude fuel and certain special items* to measure our cost-reduction progress. We believe that such analysis may be important to investors and other readers of these financial statements for the following reasons:

- By eliminating fuel expense and certain special items from our unit cost metrics, we believe that we have better visibility into the results of our non-fuel cost-reduction initiatives. *Our industry is highly competitive and is characterized by high fixed costs, so even a small reduction in non-fuel operating costs can result in a significant improvement in operating results.* *In addition, we believe that all domestic carriers are similarly impacted by changes in jet fuel costs over the long run, so it is important for management (and thus investors) to understand the impact of (and trends in) company-specific cost drivers such as labor rates and productivity, airport costs, maintenance costs, etc., which are more controllable by management.*

- *Cost per ASM excluding fuel and certain special items is one of the most important measures used by managements of both Alaska and Horizon and by our Board of Directors in assessing quarterly and annual cost performance.* For Alaska Airlines, these decision-makers evaluate operating results of the "mainline" operation, which includes the operation of the B737 fleet branded in Alaska Airlines livery. The revenue and expenses associated with purchased capacity are evaluated separately.

- *Cost per ASM excluding fuel (and other items as specified in our plan documents) is an important metric for the PBP incentive plan that covers the majority of our employees.*

- *Cost per ASM excluding fuel and certain special items is a measure commonly used by industry analysts, and we believe it is the basis by which they compare our airlines to others in the industry. The measure is also the subject of frequent questions from investors.*

- Disclosure of the individual impact of certain noted items provides investors the ability to measure and monitor performance both with and without these special items. We believe that disclosing the impact of certain items such as fleet transition costs, new pilot contract transition costs, and restructuring charges is important because it provides information on significant items that are not necessarily indicative of future performance. Industry analysts and investors consistently measure our performance without these items for better comparability between periods and among other airlines.

- *Although we disclose our "mainline" passenger unit revenue for Alaska, we do not (nor are we able to) evaluate mainline unit revenue excluding the impact that changes in fuel costs have had on ticket prices. Fuel expense represents a large percentage of our total mainline operating expenses. Fluctuations in fuel prices often drive changes in unit revenue in the mid-to-long term.* Although we believe it is useful to evaluate non-fuel unit costs for the reasons noted above, we would caution readers of these financial statements not to place undue reliance on unit costs excluding fuel as a measure or predictor of future profitability because of the significant impact of fuel costs on our business".

Source: Alaska Airlines 2009 10-K Report.

2) Continental Airlines provides a detailed reconciliation between GAAP CASM and non-GAAP CASM excluding special charges, fuel expenses and related taxes for the last 5 years separately at the mainline carrier level and at the consolidated level. Source: Continental Airlines 2009 10-K Report.

3) Delta Airlines provides a detailed reconciliation between GAAP CASM and non-GAAP CASM (excluding special items, fuel expenses, and related taxes). Source: Delta Airlines 2009 10-K Report.

4) Southwest Airlines provides a detailed breakdown of CASM into its individual components. Source: Southwest Airlines 2009 10-K Report.

5) Republic Airways reports CASM in its annual report and explains: "Cost per available seat mile utilizing this measurement is included as it is a measurement recognized by the investing public relative to the airline industry". Source: Republic Airways 2009 10-K Report.

In general, all airlines report CASM on a total operating cost basis, as well as on an individual cost component basis.

C. Evidence From Wall Street Analyst Reports (emphasis mine)

Numerous reports from various investment banking firms have comparisons of CASM among airlines.

W. Greene, Morgan Stanley analyst (ranked as the top airline analyst by Forbes in 2009 and with an uninterrupted record of following several airlines) states: **"As we have written numerous times in the past, we view low costs as one of the most important competitive advantages an airline can have"**, (Greene, Morgan Stanley Equity Research, May 17, 2007). This comment is placed in the context of a chart showing the stage-length-adjusted CASM excluding fuel expenses of all major airlines on a relative basis.[25] This analyst provides regular updates of an airline's CASM relative to the CASM of its competitors.

D. McKenzie of Credit Suisse provides updates of **"Stage-Length Adjusted CASM Relative to an Industry Average"**. He defines industry as the airline's direct competitors (e.g., a network airline's competitive set consists of other network airlines). He measures and provides charts of the following: (a) the percentage difference of a carrier's CASM from competitors' CASMs and (b) the percentage year-over-year change in the previous measure. He also ranks airlines based on an average score for investment evaluation purposes, which is based on 6 factors, one of which is "debt-adjusted CASM excluding fuel" (McKenzie, Credit Suisse Equity Research United States, July 19, 2006).

Other analysts who provide CASM relative to competition include:

[25] Stage-length-adjustment is a regression technique that is used to adjust airlines' average production unit cost for differences in flight segment length among carriers in order to provide a fair comparison of cost structures among airlines of different operational characteristics.

J. Baker of JP Morgan (J.P. Morgan North America Corporate Research, November 3, 2010),
A. Light of Citigroup (Citigroup Small/Mid-Cap Research, November 8, 2005),
and F. Boroch of Bear Sterns (Bear Sterns Equity Research, May 29, 2007).

APPENIX C
Variable Definitions

Variable		Definition	Pred. assoc.	Previous literature / reasoning
ΔlnCOMP	≡	Change in the natural logarithm of the CEO's salary + bonus + value of stock option portfolio + value of earned but unvested restricted stock portfolio + long term (non-equity) incentive payouts (LTIP).		
ΔlnCASM	≡	Change in the natural logarithm of own-firm operating cost per ASM.	-	H1, H3a/b, H4
ΔlnSUBS_CASM	≡	Change in the natural logarithm of average substitute-peer-group operating cost per ASM.	+	H3a/b, H4
ΔlnCOMPL_CASM	≡	Change in the natural logarithm of average complement-peer-group operating cost per ASM.	-	H3a/b, H4
ΔlnPEER_CASM		Change in the natural logarithm of average total-peer-group operating cost per ASM.	+	H1
ΔROA	≡	Change in own-firm ROA.	+	H1
ΔPEER_ROA	≡	Change in average peer-group ROA.	-	H1
SYS_CASM		The systematic component of a firm's CASM, i.e., the component of CASM that is correlated with the CASM of the firm's peer group of airlines.	0	H2
UNSYS_CASM		The unsystematic component of a firm's CASM, i.e., CASM excluding the component that is correlated with the CASM of the firm's peer group of airlines.	-	H2
SYS_ROA		The systematic component of a firm's ROA, i.e., the component of ROA that is correlated with the ROA of the firm's peer group of airlines.	0	H2
UNSYS_ROA		The unsystematic component of a firm's ROA, i.e., ROA excluding the component that is correlated with the ROA of the firm's peer group of airlines.	+	H2
FUEL_CASM	≡	Fuel expenses divided by the number of ASMs.	0	H2
EXFUEL_CASM	≡	Total operating expenses excluding fuel expenses divided by the number of ASMs.	-	H2

Appendix C, cont'd.

Variable		Definition	Pred. assoc.	Previous literature / reasoning
lnCEO_TENURE		The natural logarithm of the CEO's tenure in the CEO position.	+/-	Dechow and Sloan, 1991; Gibbons and Murphy, 1992; Core and Guay, 1999; Bertrand and Mullainathan, 2001.
TRANSIENT (%)		The combined voting power in the firm's ownership structure of private equity funds, activist investor funds, and hedge funds. This is a proxy for the firm's equityholders' investment horizon. The greater the % of transient investors in the firm's ownership structure, the shorter is the firm's equityholders' investment horizon.	+	Dikolli, Kulp, and Sedatole, 2009; Bushee, 1998; Bushee, 2001; Bushee, 2001.
lnCEO_AGE		The natural logaritm of the CEO's age.	+	Dechow and Sloan, 1991; Gibbons and Murphy, 1992; Brickley, Linck, and Coles, 1999; Garvey and Milbourn, 2003.
CEO_CHAIR (1/0)	≡	1 if the CEO is also the chairman of the board, otherwise 0.	+	Yermack, 1996; Core, Holthausen and Larcker, 1999.
LOW_COST (1/0)	≡	1 if the airline is classified as a low-cost carrier, 0 otherwise.	-	Doganis, 2002. Low-cost carriers have lower CASM are likely to pay lower compensation to the CEO.
BTM (%)	≡	The book-to-market ratio calculated as the ratio of book assets including capitalized operating leases to the sum of book liabilities including capitalized operating leases and the market value of equity.	+	Smith and Watts, 1992; Gaver and Gaver, 1993; Core and Guay, 1999.
LEVERAGE (%)	≡	The leverage ratio calculated as the ratio of book liabilities including capitalized operating leases to book assets including capitalized operating leases.	-	Smith and Watts, 1992; John and John, 1993.
ΔlnASSETS	≡	The change in the natural logarithm of book assets including capitalized operating leases.	+	Smith and Watts, 1992; Core and Guay, 1999; Baker and Hall, 2004.

Appendix C, cont'd.

Variable		Definition	Pred. assoc.	Previous literature / reasoning
ΔlnSEGMENT_ LENGTH	≡	The change in the natural logarithm of average segment length.	+/-	Banker and Johnston, 1993; Caves, Christensen, and Tretheway, 1984. Negatively associated with CASM; potentially associated with compensation.
ΔlnSEAT_DENSITY	≡	The change in the natural logarithm of average seating capacity.	+/-	Banker and Johnston, 1993. Negatively associated with CASM; potentially associated with compensation.
ΔlnLOAD_FACTOR	≡	The change in the natural logarithm of the load factor (the % of seats on a flightthat are sold).	+	Doganis, 2002, p. 105. Positively associated with compensation, and CASM (e.g., influences the type of aircraft flown, size of cabin crew, etc.).
UNIONIZATION (%)	≡	The percentage of an airline's FTEs (Full-time Equivalent Employees) who are members of a labor union organization.	-	Firms with greater union representation are likely to pay lower compensation to the CEO and to have higher CASM.
CEO_VOT_ POWER (%)	≡	The CEO's voting power.	+	Lambert, Larcker, and Weigelt, 1993; Core, 1997; Core, Holthausen and Larcker, 1999.
HHI (%)	≡	The Herfindahl-Hirschman Index in an airline's product markets.		R. Schmalensee, 1989, p. 966.
COMPETITION (1/0)	≡	=1 if HHI <= 18%, =0 otherwise.		DOJ Horizontal Merger Guidelines § 1.51, 1992, revised 1997.

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TABLE 1
Airlines by Product Market Segment, Type of Ownership and Frequency

Airline	Network	Regional	Public	Private	# Obs	Frequency
Air Wisconsin		✓		✓	18	3.3%
AirTran Airways	✓		✓		15	2.8%
Alaska Airlines	✓		✓		18	3.3%
Allegiant Air	✓		✓		6	1.1%
Aloha Airlines	✓			✓	17	3.1%
America West Airlines	✓		✓		13	2.4%
American Airlines	✓		✓		18	3.3%
American Eagle		✓		✓	18	3.3%
ATA Airlines	✓		✓		16	3.0%
Atlantic Southeast		✓	✓		12	2.2%
Business Express		✓		✓	5	0.9%
Comair		✓		✓	8	1.5%
Compass Airlines		✓		✓	3	0.6%
Continental Airlines	✓		✓		18	3.3%
Continental Micronesia		✓		✓	16	3.0%
Delta Airlines	✓		✓		18	3.3%
Executive Airlines		✓		✓	18	3.3%
Expressjet Airlines		✓	✓		14	2.6%
Flagship Airlines		✓		✓	1	0.2%
Frontier Airlines	✓		✓		16	3.0%
Hawaiian Airlines	✓		✓		18	3.3%
Horizon Air		✓		✓	18	3.3%
Independence Air		✓	✓		3	0.6%
JetBlue Airways	✓		✓		10	1.9%
Mesa Airlines Inc.		✓	✓		11	2.0%
Mesaba Airlines		✓	✓		13	2.4%
Midway Airlines	✓		✓		7	1.3%
Midwest Airlines	✓		✓		18	3.3%
Northwest Airlines	✓		✓		16	3.0%
Pan American	✓			✓	3	0.6%
Pinnacle Airlines		✓	✓		6	1.1%
PSA Airlines		✓		✓	6	1.1%
Reno Air	✓		✓		7	1.3%
Republic Airlines		✓	✓		5	0.9%
Skywest Airlines		✓	✓		7	1.3%
Southwest Airlines	✓		✓		18	3.3%
Spirit Air	✓			✓	15	2.8%

Table 1, cont.

Airline	Network	Regional	Public	Private	# Obs	Frequency
Tower Air	✓		✓		8	1.5%
Trans States Airlines		✓		✓	18	3.3%
Trans World Airways	✓		✓		9	1.7%
United Airlines	✓		✓		18	3.3%
US Airways	✓		✓		18	3.3%
USAir Shuttle		✓		✓	9	1.7%
Vanguard Airlines	✓		✓		6	1.1%
Westair Airlines		✓		✓	2	0.4%
Western Pacific Air	✓		✓		3	0.6%
Total Airlines	**25**	**21**	**30**	**16**	**540**	**100.0%**
Network Airlines			**22**	**3**	**329**	**60.9%**
Regional Airlines			**8**	**13**	**211**	**39.1%**

Note: Non-publicly traded airline data are used in the calculation of average peer-group performance measures.

TABLE 2
Composition of Sample

Panel A: Sample Selection Criteria *

	Total firms	Total firm-years
Airline operating cost and operational statistics (DOT) [1]	78	940
Less all-cargo carriers and passenger charter carriers	32	400
Less airline compensation data missing from EXECUCOMP [2]	33	379
Data included both in DOT schedules and EXECUCOMP	13	161
Plus airline compensation data hand-collected from firms' DEF-14A reports	17	116
Final sample	**30**	**277**

[1] Schedules P-12/11, P-6, P-52/51, P10, B43, T1, and T3; years 1992-2009.

[2] Includes subsidiaries.

* The DOT databases contain data on all airlines with $20 million or more in annual revenues (including both public and private airlines, as well as subsidiaries of network carriers), resulting in data for 78 U.S.-based air carriers yielding a total of 940 firm-years. I drop all-cargo airlines and passenger charter airlines, reducing the number of firms by 32 and the number of firm-years by 400. Several years during the period from 1992 through 2009 are, for various reasons, missing for a number of airlines. For example, some airlines were founded during this period while others merged with other carriers or ceased operations. I drop airlines for which no records exist in either ExecuComp or in the SEC's database of proxy filings, further reducing the number of airlines by 33 and the number of firm-years by 379. The final sample for which all data are available consists of 30 publicly traded, U.S.-based, scheduled passenger carriers from 1992 through 2009, for a total of 277 firm-year observations.

Table 2, cont'd.

Panel B - Frequency by Airline

Airline	Network	Regional	# Obs	Frequency
AirTran Airways	✓		14	5.1%
Alaska Airlines	✓		18	6.5%
Allegiant Air	✓		4	1.4%
America West Airlines	✓		12	4.3%
American Airlines	✓		18	6.5%
ATA Airlines	✓		8	2.9%
Atlantic Southeast Airlines		✓	6	2.2%
Continental Airlines	✓		17	6.1%
Delta Airlines	✓		16	5.8%
Expressjet Airlines		✓	7	2.5%
Frontier Airlines	✓		9	3.2%
Hawaiian Airlines	✓		15	5.4%
Independence Air		✓	2	0.7%
JetBlue Airways	✓		8	2.9%
Mesa Airlines Inc.		✓	8	2.9%
Mesaba Airlines		✓	9	3.2%
Midway Airlines	✓		4	1.4%
Midwest Airlines	✓		11	4.0%
Northwest Airlines	✓		11	4.0%
Pinnacle Airlines		✓	6	2.2%
Reno Air	✓		2	0.7%
Republic Airlines		✓	5	1.8%
Skywest Airlines		✓	7	2.5%
Southwest Airlines	✓		18	6.5%
Tower Air Inc.	✓		3	1.1%
Trans World Airways	✓		6	2.2%
United Airlines	✓		14	5.1%
US Airways	✓		16	5.8%
Vanguard Airlines Inc.	✓		2	0.7%
Western Pacific Airlines	✓		1	0.4%
Total Airlines	**22**	**8**	**277**	**100.0%**
Network Airlines			**227**	**81.9%**
Regional Airlines			**50**	**18.1%**

Table 2, cont'd.

Panel C - Frequency by Year

Year	# Obs	Frequency
1992	6	2.2%
1993	9	3.2%
1994	11	4.0%
1995	13	4.7%
1996	18	6.5%
1997	19	6.9%
1998	18	6.5%
1999	17	6.1%
2000	17	6.1%
2001	16	5.8%
2002	14	5.1%
2003	18	6.5%
2004	19	6.9%
2005	16	5.8%
2006	18	6.5%
2007	17	6.1%
2008	16	5.8%
2009	15	5.4%
Total	**277**	**100.0%**
Network Airlines	**227**	**81.9%**
Regional Airlines	**50**	**18.1%**

Table 2, cont'd.

Panel D - Selected Financial Data ($millions except when state, N=277)

	Mean	**SD**	**10th percentile**	**Median**	**90th percentile**
Sales	5,526.9	6,378.0	384.3	2,177.2	16,216.8
Book value of assets [1]	9,842.6	11,400.0	541.5	4,324.8	28,614.0
Operating income	157.8	569.5	(162.4)	56.1	825.4
Net income	9.4	1,642.7	(556.2)	20.4	465.2
Market value of equity	3,108.6	10,874.2	95.3	779.7	5,787.2
Leverage (%) [2]	88.1	13.0	71.6	89.8	101.2
Book-to-market (%) [3]	87.4	17.6	64.6	91.7	101.7
Return on Assets (%) [4]	0.2	7.0	(6.2)	0.9	5.5

[1] Includes capitalized operating leases.

[2] Book value of liabilities including capitalized leases divided by book value of assets including capitalized leases.

[3] Book value of assets including capitalized operating leases divided by the sum of book value of liabilities including capitalized leases and market value of equity.

[4] Net income divided by the book value of assets including capitalized operating leases.

TABLE 3
Descriptive Statistics

PANEL A: Variable Distributions, Total Sample (N=277)

	MEAN	SD	MIN	10th PERCENTILE	MEDIAN	90th PERCENTILE	MAX
ΔlnCOMP$_{it}$	0.078	1.806	(13.305)	(1.154)	0.078	1.226	15.293
ΔlnCASM$_{it}$	0.017	0.176	(1.079)	(0.107)	0.021	0.126	1.843
ΔlnSUBS_CASM$_{it}$	0.007	0.073	(0.432)	(0.052)	0.008	0.074	0.187
ΔlnCOMPL_CASM$_{it}$	(0.017)	0.087	(0.200)	(0.165)	(0.001)	0.073	0.466
ΔlnPEER_CASM$_{it}$	0.005	0.123	(0.538)	(0.134)	0.003	0.139	0.529
ΔROA$_{it}$	(0.003)	0.087	(0.612)	(0.070)	(0.000)	0.051	0.688
ΔPEER_ROA$_{it}$	(0.000)	0.065	(0.355)	(0.061)	0.002	0.054	0.580
lnCEO_TENURE$_{it}$	1.356	1.105	(2.499)	(0.132)	1.504	2.731	3.556
TRANSIENT$_{it}$ (%)	11.857	18.792	0.000	0.000	0.000	44.600	69.700
lnCEO_AGE$_{it}$	3.983	0.119	3.584	3.829	3.989	4.127	4.277
CEO_CHAIR$_{it}$ (1/0)	0.672	0.470	0.000	0.000	1.000	1.000	1.000
LOW_COST$_{it}$ (1/0)	0.243	0.430	0.000	0.000	0.000	1.000	1.000
BTM$_{it}$ (%)	88.116	16.780	0.444	66.117	92.384	101.770	126.715
LEVERAGE$_{it}$ (%)	88.135	12.954	41.496	71.012	89.996	101.151	118.131
ΔlnASSETS$_{it}$	0.071	0.191	(1.517)	(0.048)	0.071	0.241	0.566
ΔlnSEGMENT_LENGTH$_{it}$	0.026	0.075	(0.231)	(0.033)	0.022	0.071	0.769
ΔlnSEAT_DENSITY$_{it}$	0.007	0.066	(0.262)	(0.029)	0.003	0.037	0.789
ΔlnLOAD_FACTOR$_{it}$	0.017	0.040	(0.160)	(0.027)	0.016	0.064	0.255
UNIONIZATION$_{it}$ (%)	0.541	0.258	0.000	0.165	0.562	0.840	0.910
CEO_VOT_POWER$_{it}$ (%)	3.324	10.398	0.000	0.138	1.021	4.832	76.456
HHI$_{it}$ (%)	0.258	0.144	0.119	0.136	0.211	0.498	0.805
COMPETITION$_{it}$ (1/0)	0.368	0.483	0.000	0.000	0.000	1.000	1.000

Table 3, cont.

PANEL B: Variable Distributions, Network Airlines (N=227)

	MEAN	SD	MIN	10th PERCENTILE	MEDIAN	90th PERCENTILE	MAX
ΔlnCOMP$_{it}$	0.115	1.931	(13.305)	(0.967)	0.095	1.226	15.293
ΔlnCASM$_{it}$	0.016	0.089	(0.292)	(0.103)	0.015	0.116	0.352
ΔlnSUBS_CASM$_{it}$	0.014	0.064	(0.169)	(0.045)	0.008	0.074	0.187
ΔlnCOMPL_CASM$_{it}$	(0.028)	0.074	(0.200)	(0.165)	(0.015)	0.073	0.085
lnCEO_TENURE$_{it}$	1.164	1.073	(2.499)	(0.403)	1.312	2.383	3.178
TRANSIENT$_{it}$ (%)	12.041	19.869	0.000	0.000	0.000	52.200	69.700
lnCEO_AGE$_{it}$	3.988	0.125	3.584	3.829	4.007	4.127	4.277
CEO_CHAIR$_{it}$ (1/0)	0.698	0.460	0.000	0.000	1.000	1.000	1.000
LOW_COST$_{it}$ (1/0)	0.293	0.456	0.000	0.000	0.000	1.000	1.000
BTM$_{it}$ (%)	87.026	17.001	0.444	66.117	91.588	100.788	118.131
LEVERAGE$_{it}$ (%)	89.378	12.409	47.578	72.479	90.585	101.556	118.131
ΔlnASSETS$_{it}$	0.091	0.112	(0.205)	(0.031)	0.077	0.241	0.499
ΔlnSEGMENT_LENGTH$_{it}$	0.025	0.054	(0.174)	(0.019)	0.023	0.068	0.373
ΔlnSEAT_DENSITY$_{it}$	0.000	0.032	(0.262)	(0.029)	0.003	0.026	0.084
ΔlnLOAD_FACTOR$_{it}$	0.017	0.035	(0.063)	(0.022)	0.016	0.063	0.150
UNIONIZATION$_{it}$ (%)	0.547	0.267	0.000	0.162	0.563	0.850	0.910
CEO_VOT_POWER$_{it}$ (%)	3.424	11.390	0.000	0.099	0.788	4.415	76.456
HHI$_{it}$ (%)	0.233	0.120	0.119	0.131	0.194	0.363	0.663
COMPETITION$_{it}$ (1/0)	0.415	0.494	0.000	0.000	0.000	1.000	1.000

Table 3, cont.

PANEL C: Variable Distributions, Regional Airlines (N=50)

	MEAN	**SD**	**MIN**	**10th PERCENTILE**	**MEDIAN**	**90th PERCENTILE**	**MAX**
ΔlnCOMP$_{it}$	(0.104)	0.986	(2.494)	(1.432)	0.006	1.174	2.224
ΔlnCASM$_{it}$	0.024	0.383	(1.079)	(0.328)	0.030	0.274	1.843
ΔlnSUBS_CASM$_{it}$	(0.026)	0.103	(0.432)	(0.162)	(0.008)	0.072	0.085
ΔlnCOMPL_CASM$_{it}$	0.035	0.122	(0.198)	(0.064)	0.044	0.211	0.466
lnCEO_TENURE$_{it}$	2.294	0.718	0.403	1.504	2.247	3.435	3.556
TRANSIENT$_{it}$ (%)	10.957	12.390	0.000	0.000	8.196	26.610	52.976
lnCEO_AGE$_{it}$	3.958	0.073	3.807	3.871	3.951	4.060	4.111
CEO_CHAIR$_{it}$ (1/0)	0.548	0.504	0.000	0.000	1.000	1.000	1.000
LOW_COST$_{it}$ (1/0)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
BTM$_{it}$ (%)	93.433	14.712	55.516	69.922	97.344	105.838	126.715
LEVERAGE$_{it}$ (%)	82.070	13.972	41.496	60.205	83.404	95.755	99.192
ΔlnASSETS$_{it}$	(0.025)	0.379	(1.517)	(0.272)	0.048	0.192	0.566
ΔlnSEGMENT_LENGTH$_{it}$	0.028	0.137	(0.231)	(0.065)	0.019	0.071	0.769
ΔlnSEAT_DENSITY$_{it}$	0.042	0.139	(0.161)	(0.021)	0.017	0.109	0.789
ΔlnLOAD_FACTOR$_{it}$	0.021	0.058	(0.160)	(0.027)	0.016	0.064	0.255
UNIONIZATION$_{it}$ (%)	0.513	0.211	0.000	0.182	0.537	0.754	0.788
CEO_VOT_POWER$_{it}$ (%)	2.836	1.728	0.233	0.799	2.678	5.174	7.067
HHI$_{it}$ (%)	0.379	0.185	0.151	0.178	0.350	0.680	0.805
COMPETITION$_{it}$ (1/0)	0.143	0.354	0.000	0.000	0.000	1.000	1.000

TABLE 4
Correlations

PANEL A: Correlations - Strategic Interaction Hypotheses Variables

	1	2	3	4	5	6	7	8	9	10	11	12
1. ΔlnCOMP$_{it}$	1.000											
2. ΔlnCASM$_{it}$	-0.035	1.000										
3. ΔlnSUBS_CASM$_{it}$	0.072	**0.270**	1.000									
4. ΔlnCOMPL_CASM$_{it}$	0.051	**0.170**	**0.321**	1.000								
5. lnCEO_TENURE$_{it}$	0.013	-0.018	-0.084	**0.174**	1.000							
6. TRANSIENT$_{it}$	0.060	0.018	0.019	0.014	**-0.201**	1.000						
7. lnCEO_AGE$_{it}$	-0.053	-0.043	-0.011	-0.030	**0.280**	-0.118	1.000					
8. CEO_CHAIR$_{it}$	-0.051	-0.004	0.015	-0.038	**0.327**	**-0.244**	**0.313**	1.000				
9. LOW_COST$_{it}$	0.009	0.022	0.069	-0.075	**-0.137**	**-0.169**	0.025	-0.114	1.000			
10. BTM$_{it}$	-0.057	-0.032	-0.104	-0.117	-0.069	**0.119**	-0.077	-0.068	**-0.478**	1.000		
11. LEVERAGE$_{it}$	**-0.136**	-0.062	0.029	**-0.142**	**-0.324**	**0.147**	**-0.205**	-0.098	**-0.274**	**0.332**	1.000	
12. ΔlnASSETS$_{it}$	0.109	0.040	0.053	0.019	-0.008	**-0.122**	-0.039	0.106	**0.292**	**-0.222**	0.033	1.000
13. ΔlnSEGMENT_LENGTH$_{it}$	-0.001	**-0.316**	-0.051	0.003	-0.032	0.115	-0.021	0.113	-0.074	0.092	0.113	**0.243**
14. ΔlnSEAT_DENSITY$_{it}$	0.042	**-0.383**	-0.109	0.090	**0.147**	-0.081	-0.077	0.074	**-0.129**	**0.185**	0.050	**0.182**
15. ΔlnLOAD_FACTOR$_{it}$	**0.154**	-0.044	-0.019	0.115	-0.018	-0.038	-0.086	0.059	-0.017	-0.061	0.044	0.080
16. UNIONIZATION$_{it}$	-0.087	-0.013	0.022	0.024	-0.114	0.109	-0.010	**-0.130**	**-0.273**	0.062	**0.192**	**-0.197**
17. CEO_VOT_POWER$_{it}$	-0.041	0.003	-0.051	-0.018	0.027	-0.068	**0.226**	**0.165**	**0.148**	-0.021	-0.012	0.112
18. HHI$_{it}$	-0.007	-0.009	-0.112	0.116	0.037	-0.039	-0.045	**-0.284**	**-0.327**	0.025	-0.001	**-0.169**
19. COMPETITION$_{it}$	0.011	0.037	0.048	-0.038	-0.022	**0.160**	-0.077	0.078	**0.304**	-0.032	0.021	**0.252**

Bold font indicates statistical significance at $p<.05$.

Table 4, cont.

PANEL A: Correlations - Strategic Interaction Hypotheses Variables

	13	14	15	16	17	18	19
1. ΔlnCOMP$_{it}$							
2. ΔlnCASM$_{it}$							
3. ΔlnSUBS_CASM$_{it}$							
4. ΔlnCOMPL_CASM$_{it}$							
5. lnCEO_TENURE$_{it}$							
6. TRANSIENT$_{it}$							
7. lnCEO_AGE$_{it}$							
8. CEO_CHAIR$_{it}$							
9. LOW_COST$_{it}$							
10. BTM$_{it}$							
11. LEVERAGE$_{it}$							
12. ΔlnASSETS$_{it}$							
13. ΔlnSEGMENT_LENGTH$_{it}$	1.000						
14. ΔlnSEAT_DENSITY$_{it}$	**0.623**	1.000					
15. ΔlnLOAD_FACTOR$_{it}$	**0.389**	**0.235**	1.000				
16. UNIONIZATION$_{it}$	0.033	0.020	-0.016	1.000			
17. CEO_VOT_POWER$_{it}$	-0.096	-0.091	-0.024	**-0.162**	1.000		
18. HHI$_{it}$	-0.066	-0.017	0.035	**0.215**	**-0.137**	1.000	
19. COMPETITION$_{it}$	0.043	-0.005	-0.033	**-0.164**	**0.153**	**-0.569**	1.000

Bold font indicates statistical significance at p<.05.

Table 4, cont.

PANEL B: Correlations - RPE Hypotheses Variables

	1	2	3	4	5	6	7	8	9	10	11	12
1. ΔlnCOMP$_{it}$	1.000											
2. ΔlnCASM$_{it}$	-0.035	1.000										
3. ΔlnPEER_CASM$_{it}$	-0.049	**0.178**	1.000									
4. ΔROA$_{it}$	**0.182**	**-0.193**	**-0.132**	1.000								
5. ΔPEER_ROA$_{it}$	0.064	-0.095	**-0.199**	**0.137**	1.000							
6. lnCEO_TENURE$_{it}$	0.013	-0.018	-0.045	-0.006	0.029	1.000						
7. TRANSIENT$_{it}$	0.060	0.018	0.009	-0.001	0.000	**-0.201**	1.000					
8. lnCEO_AGE$_{it}$	-0.053	-0.043	-0.047	-0.057	0.020	**0.280**	-0.118	1.000				
9. CEO_CHAIR$_{it}$	-0.051	-0.004	0.018	-0.015	-0.005	**0.327**	**-0.244**	**0.313**	1.000			
10. LOW_COST$_{it}$	0.009	0.022	0.030	-0.023	0.018	**-0.137**	**-0.169**	0.025	-0.114	1.000		
11. BTM$_{it}$	-0.057	-0.032	-0.079	-0.017	-0.050	-0.069	**0.119**	-0.077	-0.068	**-0.478**	1.000	
12. LEVERAGE$_{it}$	**-0.136**	-0.062	-0.011	-0.049	-0.032	**-0.324**	**0.147**	**-0.205**	-0.098	**-0.274**	**0.332**	1.000
13. ΔlnASSETS$_{it}$	0.109	0.040	0.005	0.055	-0.025	-0.008	**-0.122**	-0.039	0.106	**0.292**	**-0.222**	0.033
14. ΔlnSEGMENT_LENGTH$_{it}$	-0.001	**-0.316**	**-0.133**	**0.164**	-0.025	-0.032	0.115	-0.021	0.113	-0.074	0.092	0.113
15. ΔlnSEAT_DENSITY$_{it}$	0.042	**-0.383**	**-0.148**	0.049	-0.053	**0.147**	-0.081	-0.077	0.074	**-0.129**	**0.185**	0.050
16. ΔlnLOAD_FACTOR$_{it}$	**0.154**	-0.044	-0.044	**0.292**	0.053	-0.018	-0.038	-0.086	0.059	-0.017	-0.061	0.044
17. UNIONIZATION$_{it}$	-0.087	-0.013	0.067	0.013	0.003	-0.114	0.109	-0.010	**-0.130**	**-0.273**	0.062	**0.192**
18. CEO_VOT_POWER$_{it}$	-0.041	0.003	-0.052	-0.067	0.018	0.027	-0.068	**0.226**	**0.165**	**0.148**	-0.021	-0.012

Bold font indicates statistical significance at p<.05.

Table 4, cont.

PANEL B: Correlations - RPE Hypotheses Variables

	13	14	15	16	17	18
1. $\Delta lnCOMP_{it}$						
2. $\Delta lnCASM_{it}$						
3. $\Delta lnPEER\_CASM_{it}$						
4. ΔROA_{it}						
5. $\Delta PEER\_ROA_{it}$						
6. $lnCEO\_TENURE_{it}$						
7. $TRANSIENT_{it}$						
8. $lnCEO\_AGE_{it}$						
9. CEO_CHAIR_{it}						
10. LOW_COST_{it}						
11. BTM_{it}						
12. $LEVERAGE_{it}$						
13. $\Delta lnASSETS_{it}$	1.000					
14. $\Delta lnSEGMENT\_LENGTH_{it}$	**0.243**	1.000				
15. $\Delta lnSEAT\_DENSITY_{it}$	**0.182**	**0.623**	1.000			
16. $\Delta lnLOAD\_FACTOR_{it}$	0.080	**0.389**	**0.235**	1.000		
17. $UNIONIZATION_{it}$	**-0.197**	0.033	0.020	-0.016	1.000	
18. $CEO\_VOT\_POWER_{it}$	0.112	-0.096	-0.091	-0.024	**-0.162**	1.000

Bold font indicates statistical significance at p<.05.

TABLE 5
Empirical Results: Hypothesis H1

		Dependent Variable: $\Delta lnCOMP_{it}$	
		Model 1	Model 2
$\Delta lnCASM_{it}$	H1(-)	-0.939***	
		(0.008)	
$\Delta lnPEER\_CASM_{it}$	H1(+)	-0.567	
		(0.250)	
ΔROA_{it}	H1(+)		2.320***
			(0.010)
$\Delta PEER\_ROA_{it}$	H1(-)		-0.0937
			(0.454)
$lnCEO\_TENURE_{it}$	+/-	-0.133	-0.124
		(0.206)	(0.205)
$TRANSIENT_{it}$	+	0.0118**	0.0120**
		(0.019)	(0.017)
$lnCEO\_AGE_{it}$	+	0.0246	0.212
		(0.487)	(0.390)
CEO_CHAIR_{it}	+	-0.185	-0.195
		(0.226)	(0.221)
LOW_COST_{it}	-	-0.375**	-0.336*
		(0.050)	(0.060)
BTM_{it}	+	-0.00324	-0.00443
		(0.370)	(0.318)
$LEVERAGE_{it}$	-	-0.0243**	-0.0213*
		(0.021)	(0.030)
$\Delta lnASSETS_{it}$	+	1.732**	1.511**
		(0.030)	(0.049)
$\Delta lnSEGMENT\_LENGTH_{it}$	+/-	-3.599	-3.635
		(0.126)	(0.143)
$\Delta lnSEAT\_DENSITY_{it}$	+/-	2.002	3.344*
		(0.294)	(0.059)
$\Delta lnLOAD\_FACTOR_{it}$	+	7.485**	6.155*
		(0.031)	(0.052)
$UNIONIZATION_{it}$	-	-0.589**	-0.625**
		(0.031)	(0.026)
$CEO\_VOT\_POWER_{it}$	+	-0.00910	0.00625
		(0.487)	(0.490)
CONSTANT		3.245	2.328
		(0.264)	(0.402)
Observations (clusters)		247 (30)	247 (30)
Adjusted R^2		7.9%	8.3%

p-values in parentheses, * p<0.10, ** p<0.05, *** p<0.01, (one-tailed for predicted coefficients, two-tailed otherwise). OLS estimation with Froot (1989) robust standard errors clustered by firm. Year indicators are included, but are suppressed in the results tables.

TABLE 6
Empirical Results: Hypothesis H2

		Dependent Variable: $\Delta lnCOMP_{it}$		
		Model 1	Model 2	Model 3
ΔSYS_CASM_{it}	H2(0)	1.115		
		(0.274)		
$\Delta UNSYS\_CASM_{it}$	H2(-)	-0.818***		
		(0.010)		
ΔSYS_ROA_{it}	H2(0)		2.054	
			(0.212)	
$\Delta UNSYS\_ROA_{it}$	H2(+)		2.320***	
			(0.010)	
$\Delta lnFUEL\_CASM_{it}$	H2(0)			0.413
				(0.225)
$\Delta lnEXFUEL\_CASM_{it}$	H2(-)			-1.481**
				(0.012)
$lnCEO\_TENURE_{it}$	+/-	-0.120	-0.124	-0.113
		(0.242)	(0.205)	(0.262)
$TRANSIENT_{it}$	+	0.0124**	0.0120**	0.0127**
		(0.017)	(0.017)	(0.015)
$lnCEO\_AGE_{it}$	+	0.126	0.212	0.0550
		(0.436)	(0.390)	(0.471)
CEO_CHAIR_{it}	+	-0.230	-0.195	-0.210
		(0.178)	(0.221)	(0.194)
LOW_COST_{it}	-	-0.367**	-0.336*	-0.358*
		(0.048)	(0.060)	(0.061)
BTM_{it}	+	-0.00313	-0.00443	-0.00228
		(0.377)	(0.318)	(0.408)
$LEVERAGE_{it}$	-	-0.0241**	-0.0213*	-0.0247**
		(0.021)	(0.030)	(0.020)
$\Delta lnASSETS_{it}$	+	1.715**	1.511**	1.623**
		(0.029)	(0.049)	(0.039)
$\Delta lnSEGMENT\_LENGTH_{it}$	+/-	-3.480	-3.635	-4.165*
		(0.147)	(0.143)	(0.094)
$\Delta lnSEAT\_DENSITY_{it}$	+/-	2.379	3.344*	2.415
		(0.198)	(0.059)	(0.180)
$\Delta lnLOAD\_FACTOR_{it}$	+	7.683**	6.155*	7.420**
		(0.026)	(0.052)	(0.031)
$UNIONIZATION_{it}$	-	-0.648**	-0.625**	-0.578**
		(0.027)	(0.026)	(0.039)
$CEO\_VOT\_POWER_{it}$	+	0.00877	0.00625	-0.0175
		(0.487)	(0.490)	(0.474)
CONSTANT		2.867	2.328	3.120
		(0.315)	(0.402)	(0.259)

Table 6, cont.

Observations (clusters)	247 (30)	247 (30)	247 (30)
Adjusted R^2	8.2%	8.3%	8.5%

p-values in parentheses, * $p<0.10$, ** $p<0.05$, *** $p<0.01$, (one-tail for predicted coefficients, two-tailed otherwise). OLS estimation with Froot (1989) robust standard errors clustered by firm. Year indicators are included, but are suppressed in the results tables.

TABLE 7
Empirical Results: Hypotheses H3a/H3b and H4

		Dependent Variable: ΔlnCOMP$_{it}$			
		Model 1	Model 2	Model 3	Model 4
ΔlnCASM$_{it}$	H3a/b(-)	-0.711**	-1.017***	-0.833***	-0.922*
		(0.021)	(0.003)	(0.009)	(0.097)
ΔlnSUBS_CASM$_{it}$	H3a(+)	5.728***		4.330**	5.675**
		(0.002)		(0.013)	(0.015)
ΔlnCOMPL_CASM$_{it}$	H3b(-)		-4.637***	-2.983***	-3.553***
			(0.001)	(0.008)	(0.008)
COMPETITION$_{it}$					-0.147
					(0.581)
COMPETITION$_{it}$ × ΔlnCASM$_{it}$	H4(+)				0.266
					(0.403)
COMPETITION$_{it}$ × ΔlnSUBS_CASM$_{it}$	H4(+)				4.527*
					(0.092)
COMPETITION$_{it}$ × ΔlnCOMPL_CASM$_{it}$	H4(-)				-2.272
					(0.103)
lnCEO_TENURE$_{it}$	+/-	-0.0975	-0.108	-0.0906	-0.0958
		(0.338)	(0.277)	(0.362)	(0.313)
TRANSIENT$_{it}$	+	0.0126**	0.0124**	0.0127**	0.0139**
		(0.013)	(0.013)	(0.011)	(0.027)
lnCEO_AGE$_{it}$	+	0.00541	0.0477	0.00772	-0.0754
		(0.497)	(0.474)	(0.495)	(0.456)
CEO_CHAIR$_{it}$	+	-0.263	-0.252	-0.281	-0.223
		(0.144)	(0.151)	(0.126)	(0.166)
LOW_COST$_{it}$	-	-0.422**	-0.462**	-0.464**	-0.450**
		(0.030)	(0.019)	(0.019)	(0.029)
BTM$_{it}$	+	-0.00314	-0.00360	-0.00337	-0.00283
		(0.366)	(0.353)	(0.356)	(0.376)
LEVERAGE$_{it}$	-	-0.0253**	-0.0268**	-0.0267**	-0.0266**
		(0.016)	(0.013)	(0.012)	(0.013)
ΔlnASSETS$_{it}$	+	1.719**	1.781**	1.759**	1.855**
		(0.025)	(0.021)	(0.021)	(0.022)
ΔlnSEGMENT_LENGTH$_{it}$	+/-	-3.462	-3.653	-3.569	-4.147*
		(0.145)	(0.121)	(0.131)	(0.072)
ΔlnSEAT_DENSITY$_{it}$	+/-	3.296*	2.427	3.178*	3.564*
		(0.073)	(0.174)	(0.063)	(0.063)
ΔlnLOAD_FACTOR$_{it}$	+	7.232**	7.582**	7.338**	6.794*
		(0.035)	(0.026)	(0.030)	(0.052)
UNIONIZATION$_{it}$	-	-0.604**	-0.633**	-0.620**	-0.592**
		(0.031)	(0.024)	(0.028)	(0.036)
CEO_VOT_POWER$_{it}$	+	0.00360	0.0253	0.0197	0.0464
		(0.494)	(0.462)	(0.471)	(0.430)

Table 7, cont.

CONSTANT	3.433	3.374	3.532	3.817
	(0.194)	(0.201)	(0.163)	(0.132)
Observations (clusters)	247 (30)	247 (30)	247 (30)	247 (30)
Adjusted R^2	9.7%	9.4%	9.8%	8.7%

p-values in parentheses, * p<0.10, ** p<0.05, *** p<0.01, (one-tail for predicted coefficients, two-tailed otherwise). OLS estimation with Froot (1989) robust standard errors clustered by firm. Year indicators are included, but are suppressed in the results tables.

TABLE 8
Supplemental Analysis for H1 and H3a/b Tests

		Dependent Variable: $\Delta lnCOMP_{it}$			
		Model 1	Model 2	Model 3	Model 4
$\Delta UNSYS\_CASM_{it}$	-	-0.586**	-0.973***		
		(0.037)	(0.007)		
$\Delta SUBS\_UNSYS\_CASM_{it}$	H3(+)	3.841*			
		(0.072)			
$\Delta COMPL\_UNSYS\_CASM_{it}$	H3(-)		-4.499*		
			(0.064)		
$\Delta EXFUEL\_CASM_{it}$	H3a/b(-)			-1.042***	-1.031***
				(0.014)	(0.005)
$\Delta SUBS\_EXFUEL\_CASM_{it}$	H3(+)			3.582*	
				(0.057)	
$\Delta COMPL\_EXFUEL\_CASM_{it}$	H3(-)				-5.944***
					(0.000)
$lnCEO\_TENURE_{it}$	+/-	-0.127	-0.127	-0.118	-0.104
		(0.219)	(0.221)	(0.255)	(0.302)
$TRANSIENT_{it}$	+	0.0123**	0.0130**	0.0121**	0.0133**
		(0.015)	(0.014)	(0.017)	(0.012)
$lnCEO\_AGE_{it}$	+	0.0979	0.119	0.0345	-0.0829
		(0.449)	(0.439)	(0.482)	(0.453)
CEO_CHAIR_{it}	+	-0.230	-0.210	-0.231	-0.235
		(0.180)	(0.192)	(0.183)	(0.168)
LOW_COST_{it}	-	-0.387**	-0.375**	-0.423**	-0.394**
		(0.039)	(0.043)	(0.034)	(0.035)
BTM_{it}	+	-0.00343	-0.00316	-0.00293	-0.00357
		(0.361)	(0.374)	(0.379)	(0.351)
$LEVERAGE_{it}$	-	-0.0243**	-0.0246**	-0.0259**	-0.0256**
		(0.019)	(0.018)	(0.019)	(0.016)
$\Delta lnASSETS_{it}$	+	1.769**	1.755**	1.796**	1.703**
		(0.027)	(0.025)	(0.024)	(0.024)
$\Delta lnSEGMENT\_LENGTH_{it}$	+/-	-3.229	-3.529	-3.466	-4.261*
		(0.189)	(0.137)	(0.168)	(0.069)
$\Delta lnSEAT\_DENSITY_{it}$	+/-	2.567	2.133	2.496	3.196*
		(0.184)	(0.244)	(0.155)	(0.053)
$\Delta lnLOAD\_FACTOR_{it}$	+	7.368**	6.996**	7.654**	6.158*
		(0.034)	(0.045)	(0.026)	(0.067)
$UNIONIZATION_{it}$	-	-0.624**	-0.638**	-0.591**	-0.647**
		(0.028)	(0.026)	(0.035)	(0.024)
$CEO\_VOT\_POWER_{it}$	+	0.00279	0.00929	-0.0183	-0.00223
		(0.496)	(0.486)	(0.473)	(0.496)
CONSTANT		2.995	2.310	3.319	4.032
		(0.281)	(0.400)	(0.239)	(0.118)

Table 8, cont.

Observations (clusters)	247 (30)	247 (30)	247 (30)	247 (30)
Adjusted R^2	9.0%	9.2%	9.0%	10.4%

p-values in parentheses, * p<0.10, ** p<0.05, *** p<0.01, (one-tail for predicted coefficients, two-tailed otherwise). OLS estimation with Froot (1989) robust standard errors clustered by firm. Year indicators are included, but are suppressed in the results tables.