An Empirical Investigation of the Relationship between Profit Margin Persistence and Firms' Choice of Business Model: Evidence from the US Airline Industry

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Abstract

This paper examines the influence of a firm's business model on the relative persistence of profit margins in the U.S. airline industry. The strategic management literature describes a firm's business model as reflecting how that firm chooses to compete in the marketplace. Given this linkage between business model, competition and the marketplace, we conjecture that the persistence of profit margins will be influenced by firms' choices of business model. Further, we hypothesize that this choice of business model influences the relative persistence of the individual revenue and expense components of current profit margins for future margins. We test these conjectures by (1) partitioning our sample firms according to business model (network carriers versus low-cost carriers), and (2) decomposing sample firms' profit margins into components relating to pricing policy, input cost control, and productivity. While low-cost carriers are, on average, more profitable than their network carrier counterparts, we find that the margins of network carriers tend to be more persistent than those of low-cost carriers, and that this differential persistence is reflected in the association between current revenue and expense components and future margins.

Key words: Profit margin persistence, business model, U.S. airline industry

1.0 Introduction

This paper examines the influence of business model on the relative persistence of profit margins (*PM*) in the U. S. domestic airline industry. The role of business model and/or firm strategy in explaining firm performance has been the subject of extensive management and management accounting research (e.g., Miles and Snow 1978; Mintzberg 1978, 1987; Porter 1980; Miller, 1987, 1988; Grant 1991, Kaplan and Norton 1992, Langfield-Smith 1997, 2006). Firm strategy generally is concerned with what a firm's competitive advantage should be in a given industry and how this advantage can be achieved and sustained (Porter 1980).[1] In this context, the notion of a firm's business model and/or competitive strategy is of particular importance in the execution of a firm's overall strategy since it describes how a firm would compete in a given industry and how it would make its money given the competitive context in which it operates (Malone et al. 2006, Porter 1985).

Speculation about the potential moderating effect of competition and business models on profit margin persistence has been raised by prior studies. Soliman (2008) argues that abnormal (high) profit margins tend not to persist due to competition in output markets, and, all else equal, will tend to revert to "normal" industry levels. Moreover, in explicitly acknowledging these differences in strategic focus, most financial statement analysis textbooks emphasize the need to consider the business model of the firm in forecasting future profitability. Consistent with this view, Easton *et al*. (2010, page 3-14) assert that *PM* ratios "are largely affected by a company's business model," and suggest that analyzing *PM* ratios is "relatively straightforward when comparing companies that operate in one industry."

In sum, a central observation emerging from this literature is the general supposition that a firm's business model, which mainly indicates the way in which a firm decides to compete in its respective market, should influence the relative persistence of profit margins. To the best of our knowledge, prior research has ignored the potential effect of a firm's competitive strategy in this relationship. We note that a substantial body of theoretical and empirical studies has examined the relative persistence of

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[1] For more insights to this specific description of firm strategy, we refer the reader to the classical work of Porter (1980, 1985, 1996) and Mintzberg (1978).

contemporaneous earnings (or the time-series properties of earnings) conditional on various factors.[2] Thus, our aim in this paper is not to test whether contemporaneous earnings persist in future periods since this is already well established. Instead, our objective is to explore whether a firm's choice of competitive strategy is an important determinant that affects the persistence of profit margins. Our reading of the literature suggests that this remains an open empirical question.

We address two specific research questions. First, we examine the role played by a firm's competitive strategy in influencing the relative persistence of profit margins. In particular, we assume that a firm executing its business model gives rise to earnings components that can be attributed to innovations in growth, price recovery (i.e., unit price changes in inputs and outputs), and productivity. We conjecture that current realizations of these components are associated with future profitability, and that the strength of the association depends on the business model adopted by the firm. For example, Banker *et al*. (1989, 1993) suggest that the type of business model adopted by a firm may influence whether, say, favorable effects on current margins of pricing innovations, cost management initiatives, and cost containment efforts lead to improvements in future profitability. However, to the extent that productivity gains, cost controls, and pricing policies are persistence across the types of competitive business models adopted by firms is also an open empirical question.

Therefore, our second research question investigates whether the choice of competitive business model affects the persistence among the individual revenue and expense components of profit margins. To investigate this issue, we employ the strategic profitability analysis framework developed by Banker, Datar and Kaplan 1989 [hereafter, BDK], and Horngren, Datar and Foster 2006 [hereafter, HDF]). Strategic profitability analysis is particularly useful and robust in our setting because the methodology decomposes operating income into components measuring the effects of *growth*, *price-recovery*, and *productivity*. As such, the methodology is useful in helping researchers disentangle the effects on profit margins of growth and managers' decisions regarding pricing policies, input cost control, and

[2] See, for example, Foster 1977, Brown and Rozeff 1979, Lev 1983, Kormendi and Lipe 1987, Collins and Kothari 1989, Kothari 1992, Brown and Han 2000).

productivity innovations (Banker, Chang and Majumdar 1993, BDK, HDF). Because these managerial decisions are at the heart of how a company executes its business model, strategic profitability analysis thus provides us with better insights on how these decisions influence profit margin persistence. Following the logic of BDK/HDF, we argue that "successful" initiatives, as measured by the earnings components, should breed success in the future. In other words, earnings in the future should be a function of actions taken in the present and the past. Hence, this linkage leads us to predict associations between the t-1 to t components (that reflect the success or failure of prior initiatives) and the period t+1 margins that benefit from the realization or culmination of those actions by management.

Our study focuses on the U.S. airline industry. This setting has several distinctive features that enhance our ability to draw strong conclusions regarding our research questions. First, unlike other industries in which firms may adopt similar competitive models, U.S. airlines may decide to compete with distinct business models. More specifically, airlines can follow a competitive model based on low cost (hereafter "low-cost" carriers), or alternatively, adopt a model based on service differentiation, which includes expanded routes, full services, and customer service (hereafter "network" carriers). Thus, the relatively clear classification of business models for air carriers as either "low-cost" or "network" from the Bureau of Transportation Statistics (hereafter BTS) provides two natural groups which would increase the likelihood of detecting differences (if any) across the two types of business models present in this particular industry. Second, the high level of risk inherent in airlines' business models makes the study particularly appealing. More specifically, the fact that profit margins within the industry exhibit great variation across time would allow us to perform more powerful tests of our hypotheses concerning strategic profitability analysis to examine the persistence of earnings components attributable to growth, price recovery and productivity. Last, the fact that the study concentrates on a single industry implicitly controls for industry effects; this mitigates to some extent any concerns associated with heteroscedasticity that can hinder cross-sectional studies using multiple industries.

We conduct our analyses using publicly available data from the sample firms' SEC filings and from the BTS for the 1996-2008 period. Our tests use *PM* ratios for a panel of firm-quarter and year observations. Consistent with the popular press depiction of operating performance, we find that low-cost airlines report generally higher profit margins than network carriers. More specifically, while network carriers tend to have significantly higher passenger yields, the low-cost carriers are apparently better able to control their underlying costs. As predicted, we document that profit margins are more persistent for network carriers than for low-cost carriers. This finding is consistent with the speculation of prior research, suggesting that the relative persistence of profit margins is influenced by the business model adopted by firms. Our results concerning the BDK/HDF profitability components show that, as hypothesized, these components are more strongly associated with future margins for network carriers than for low-cost carriers, suggesting greater persistence for network carriers. We interpret our results as suggesting that network carriers' business models result in (1) pricing power in less competitive markets and some economies of scale associated with a hub-and-spoke arrangement, but also (2) "stickier" operating expenses and less flexibility to mitigate input cost shocks. In contrast, while revenue-related components are less strongly associated with future margins for low-cost carriers, expense-related components are also less strongly associated with future margins, suggesting these firms are able to adjust more quickly their operating expenses in the face of changes in business conditions, such as contractions in travel demand.

The rest of our paper is organized as follows. Section 2 reviews the relevant literature. Section 3 develops our hypotheses. Section 4 describes our sample and regression models. Our main results and sensitivity tests are reported in Section 5. Our conclusions are presented in Section 6.

2.0 Literature Review

2.1 Competitive Strategy and Business Models

Firm strategy is one of the most researched concepts in both the management (Miles and Snow 1978; Mintzberg 1978, 1987; Porter 1980; Miller, 1987, 1988; Grant 1991) and management accounting literatures (Kaplan and Norton 1990, 1992; Langfield-Smith 1997, 2006). Although various descriptions exist in the extant literature as to what constitutes *strategy*, a generally accepted view is that firm strategy is concerned with what a firm's competitive advantage should be in a given industry and how this advantage can be achieved and sustained (Porter 1980).[3] Further, the goal of strategy is to utilize a firm's core competencies and capabilities to establish and maintain a unique strength in its products and services that would lead to a sustainable competitive advantage relative to its competitors (Porter 1996, Grant 2008).

An integral aspect within this characterization of strategy is the notion of a firm's competitive business model and or/competitive strategy.[4] A business model fundamentally describes how a firm would compete in a given industry and how the firm would make its money. As noted by Grant (2008, p. 21), "a business model is a statement of the basis on which a business will generate revenues and profits and it is a preliminary to strategy." More specifically, the business model defines the specific value attributes that a firm offers to its customers in a product or service and which sets it apart from the competition (Mintzberg 1987, Porter 1996). Another salient point in this discussion is that the firm must also develop an *operational strategy* that is consistent with its overall strategy. This means that the firm's operations and all of the surrounding activities, including most of management's decisions, must be aligned with the firm's value proposition (Porter 1996).

Prior research has established various typologies to characterize a firm's business model and/or competitive strategy. In particular, Porter (1985) developed a descriptive framework of competitive strategy by which firms can achieve a competitive advantage in a respective industry. According to Porter, firms can adopt either a *cost leadership,* or a *differentiation* strategy.[5] Under a *cost leadership* strategy, a firm aims to establish a competitive advantage in an industry by maintaining a low-cost position relative to its peers. This position could be achieved through operational efficiencies, process improvements, and economies of scale, among others. The key is that, by keeping production and

[3] Again, we refer the reader to the classical work of Porter (1980, 1985, 1996) and Mintzberg (1978).

[4] We use the terms *business model* and *competitive strategy* interchangeably throughout the paper, as we suggest that the two terms have very similar meanings.

[5] We note that, besides Porter's characterization of competitive strategy, other researchers have proposed other typologies. For instance, Miles and Snow (1978) proposed an alternative framework by which firms can compete in their respective industries. They argue that firms can follow a "prospector" or a "defender" competitive strategy.

operating costs low, a firm maintains a cost leadership position and is able to offer lower prices relative to the competition.

Alternatively, a firm can pursue a *differentiation* strategy as it tries to establish a comparative advantage by developing a unique strength in a product or service that would distinguish it from its competitors. For example, a firm might offer a unique set of value attributes in a product and/or service that improves on the offerings of its competitors. These could include such attributes as enhanced functionality, innovative design, higher quality, superior customer service, advanced technology, rapid delivery, customization, and other unique characteristics. Typically, because such products and services are unique and/or superior to those of competitors, they tend to command higher prices. These two typologies (cost leadership and differentiation) have been widely accepted by prior research as a useful framework with which to characterize firms' competitive positions across industries.

An important consideration in Porter's (1985) framework is that it is often difficult for a firm to position itself as an industry leader and achieve a comparative advantage on these two strategic positions simultaneously. Most firms would have to make trade offs to enable them to compete effectively in a given industry.[6] More specifically, a differentiation strategy based on product/service innovation would obviously require heavy investments in research and development in order to create and sustain that innovation. This obviously leads to higher costs and makes it more difficult for a firm to attain the lowest cost position in that industry. Similarly, focusing on high quality would require the firm to incur higher production costs to manufacture a superior product. Simply put, pursuing a differentiation strategy is an expensive proposition, thus suggesting that it is not easy to build a comparative advantage based on product innovation and achieve cost efficiency at the same time. Therefore, as noted by Porter (1996), the

[6] To better illustrate this argument, Dell Corp. has developed a successful business model based on a cost-leadership strategy. Accordingly, over time, Dell has made sizeable investments to improve its manufacturing processes, ordering, and distribution systems. These enhancements have had the effect of continuously reducing its costs. But to maintain its competitive cost structure, Dell makes only modest investments in developing new technologies and instead prefers to replicate existing technologies from its competitors. As a result, Dell falls short of being an industry leader in developing novel products and innovative technologies. In contrast, Apple Inc. has been very successful in mounting a differentiation strategy by investing heavily in development of innovative and pioneering technologies on a wide array of products. As a result, Apple has achieved a comparative advantage on the basis of technology, but falls short in achieving a cost-leadership position in the industry.

ability of a firm to effectively position itself as the industry leader on both strategic positions concurrently is constrained.[7]

2.2 Competitive Strategy and Business Models in the Airline Industry

The two strategic positions in Porter's (1985) framework are clearly delineated in the two existing competitive business models currently present in the US airline industry. Since the industry's deregulation in 1978, the airline industry has evolved into two identifiable groups: *Network* or *full-service* carriers versus *low-cost* or *discount* carriers. Accordingly, the members of each of the two groups tend to compete on similar dimensions within each group, and each has adopted competitive strategies that adhere closely to the strategic framework proposed by Porter.

On the one hand, *network* carriers tend to adopt a business model based on a "full service" or "differentiation" strategy. More specifically, the business model network carriers use to implement this strategy distinguishes the carriers from their low-cost rivals by (1) flying to more domestic destinations, (2) serving international routes, (3) offering various classes of seating arrangements (e.g., first-class, business-class, economy), (4) flying non-stop and longer routes, and (5) maintaining a relatively complex system of hubs for connecting passengers. Further, an important feature embedded in their business model is that they also seek to distinguish themselves from low-cost carriers on the basis of service quality, and, accordingly, offer a variety of services and amenities to business-class and first-class passengers. Given our prior discussion concerning how a differentiation strategy usually leads to higher costs for firms, in the case of network carriers, offering additional services and expanded routes, including the necessary fleet and infrastructure investments, leads to higher operating costs for these airlines. As a result, network carriers usually charge higher fares and make extensive use of price discrimination across different groups of travelers (e.g., first-class, business-class, leisure/economy class) based on their elasticity of demand (Ben-Yosef 2005).

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[7] Although rare, it is possible for a firm to be able to outperform its rivals by successfully adopting cost leadership and differentiation strategies concurrently. For example, Toyota has been able to maintain a low-cost leadership position by making constant improvements in manufacturing that have led to lower costs, plus it has also differentiated itself from rivals by offering superior quality.

On the other hand, *low-cost* or *discount* carriers adopt a low-cost strategy in which their main competitive priority is low airfares. Accordingly, to be able to offer reduced fares and still achieve positive returns, these carriers must keep their operating costs low. Hence, to minimize their operating costs, low-cost carriers tend to (1) fly shorter routes, (2) offer point-to-point connections (as opposed to maintaining hubs for connecting passengers), (3) fly primarily domestic routes, (4) operate simpler fleets and maintain lower levels of infrastructure, (5) service a limited number of destinations, (6) offer single-class seating, and (7) reduce amenities to a bare minimum to minimize their operating costs.[8] Also, because they tend to focus their service more on price-conscious travelers, low-cost/discount carriers tend to have simpler fare structures and make relatively limited use of price discrimination.[9]

One of the main advantages of using this specific industry setting in our study is that Porter's typologies of competitive strategy are relatively clearly defined for all firms in our sample. As noted by recent studies, a common impediment in related research is the lack of comprehensive proxies to characterize correctly a given firm's competitive strategy among various industries (e.g., David *et al*. 2002, Banker *et al*. 2010). Hence, because the industry and industry regulators so clearly differentiate the air carriers as clearly being either *low-cost* or *network* carriers, this distinction provides an unambiguous characterization of competitive business model. This enables us to obtain cleaner tests and avoid some of the potential confounding effects inherent in cross-industry business model/strategy research.

3.0 Hypotheses

In this section, we develop a set of hypotheses to illustrate why the persistence of profit margins should vary across the two groups of carriers based on their business models, and, equally importantly, we make several conjectures as to why we might observe differences in persistence among the individual

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8 We note that these are not fixed requirements in all cases. For example, Jet-Blue states in its 10-K that it competes as a low-cost carrier, yet, on its "commuter" routes, it offers amenities to business-class travelers (i.e., increased connectivity, leather-backed seating, etc.) that distinguish it from both its low-cost and network competitors.

9 For example, for a given origin/destination and departure date, Southwest tends to offer three levels of fares (in decreasing price levels): "business select" class, "any time" class, and "wanna get away" class.

components of profit margins among the two types of business models. Ahead of presenting formal hypotheses, we predict that a firm's choice of business model does influence the relative persistence of profit margins ratios and based this argument on the extent of competition as well as on various characteristics underlying the type of competitive strategy adopted by airlines.

3.1 Profit margin persistence and its relationship to business models

To better frame our first hypothesis, we begin with a brief discussion with the literature examining earnings persistence. The implication of current earnings in the persistence of future earnings (or in forecasting future profitability) is a topic that has been researched extensively in the accounting literature (see, for example, Foster 1977, Brown and Rozeff 1979, Lev 1983, Kormendi and Lipe 1987, Collins and Kothari 1989, Kothari 1992, Brown and Han 2000). Collectively, this research has established that contemporaneous earnings are autocorrelated with future earnings and that current earnings are highly persistent over time.[10]

Another finding in this research stream that is relevant to our study relates to the specific determinants that cause earnings to persist in a given industry. More specifically, prior research in the economics (e.g., Stigler 1963, Scherer 1973, Mueller, 1977; Cubbin and Geroski, 1987) and accounting (e.g., Lev 1983, Easton and Zmijewski 1989, Baginski *et al*. 1999) literatures has documented several firm-specific characteristics and economic factors that tend to affect the relation between current earnings and future earnings, including firm size, industry competition, capital intensity, and product offerings.

We posit that a firm's competitive strategy may also explain the relative persistence of earnings. Our conjecture as to why strategy may affect the persistence of profit margins is based in large part on the inherent characteristics underlying the competitive strategy (e.g., cost-leadership versus differentiation) that is chosen by a firm, which, in turn, might encourage (or lessen) the scope of competition in a particular industry. We suggest that this factor explains variability in persistence over and above that

[10] Collectively, this research has found that earnings levels are highly persistence in future periods, whereas changes in earnings (or changes in profit margins) tend to reverse over time. See, for example, Kothari (1992) and Ball et al. (1993) for further insight on the association or persistence of current earnings in future earnings.

arising from the extent of competition from the economic characteristics in an industry, such as the number of firms competing in that industry, or the level of industry concentration (i.e., perfect competition vs. monopolistic competition), as has been suggested by economic theory.

Consider the two competing business models adopted by airlines. Recall that network carriers adopt a competitive strategy on the basis of service differentiation across a wide range of small, medium and large domestic and international routes that are not typically serviced by competing low-cost carriers. However, to make this possible, network carriers typically have larger, more complex fleets and the workforce needed to operate and maintain this fleet, and typically maintain an integrated hub-and-spoke system to serve passengers with connecting flights. This allows them to capture economies of scale in density and scope (Berry *et al*. 1996, Ben Yosef 2005). But the expanded capacity and hub network entail significant capital investments and large fixed costs necessary to sustain the human and physical infrastructure.[11]

We suggest that these added investments in infrastructure and higher fixed costs create barriers to entry. As noted by economic theory, one consequence of barriers to entry is that it suppresses competition in an industry (Stigler 1966, Mueller 1977). In this particular case, it reduces the ability of low-cost carriers to enter the market or compete effectively in locations that are dominated by network carriers. The returns to reduced competition can be substantial. For instance, in locations without a significance low-cost carrier presence, network carriers are generally able to increase yields, consolidate traffic and achieve higher load factors relative to locations with a low-cost carrier presence (Nannes 2000, Gillen and Lall 2004). Hence, these barriers to entry allow network carriers to exercise higher pricing power and, accordingly, charge higher fare premiums. Conceivably, this would lead to more persistent margins.

Conversely, the business model adopted by low-cost carriers is focused on offering low airfares. To achieve acceptable returns with such a strategy, especially in highly competitive markets,

[11] Morrison and Wilson (1995) and Ben-Yosef (2005) argue that network carriers make much greater investments than low-cost carriers in maintaining their airport presence, thus giving rise to high fixed costs. These higher fixed costs imply higher network carrier operating leverage relative to that of low-cost carriers.

implementing and successfully executing an operational strategy of strict cost management is essential. But this "low-cost/low-fare model" is well-publicized and is generally the means by which new carriers attempt to enter new markets (e.g., JetBlue Airways in 2000). As speculated by Soliman (2008), this could suggest that the ability to maintain competitive advantage using a cost-leadership model may be constrained, because the operational strategy needed to compete as a low-cost carrier is well known and can be imitated by competitors. For example, the pricing discrimination possible in the network carriers' business model suggests that network carriers could match low-cost carriers' airfares, at least on a portion of the network carriers' seats.

We conjecture that network carriers' operational strategies developed over time to efficiently utilize resources in a hub-and-spoke arrangement, and the marketing strategies developed to emphasize brand loyalty and product offerings are likely to be more difficult to imitate. Using this theoretical argument, we hypothesize that network carriers have devised a relatively successful operational strategy in their business operations that is consistent with their product and one that enables them to achieve economies of scale in scope and density that are difficult to replicate by low-cost carriers. The rationale underlying this argument is that, besides the hefty capital investments that are necessary to operate a hub-and-spoke system, its sheer complexity may also require special expertise to manage it effectively. In other words, network carriers have developed a comparative advantage in running the hub-and-spoke system that cannot be easily be replicated by low-cost carriers, which enables them to reduce average variable costs as they serve more passengers. At the same time, network carriers have more leverage to imitate the operational strategy of low-cost carriers. Specifically, a number of network carriers have decided to compete head to head with low-cost carriers in several markets by creating new regional and smaller airlines that offer a similar value proposition of low-fares.[12] Hence, we conjecture that the comparative advantage that network carriers have perfected in managing their hub-and-spoke system is

[12] For example, Continental Airlines created Continental Lite a while back, and more recently, launched Continental Express to compete against low-cost airlines catering on the same business model of low fares. On the other hand, Delta Airlines rolled out its low-cost Song operation to much fanfare in 2003, but soon quietly reintegrated the subsidiary's operations back into its operations because of poor operating results.

difficult to replicate, and, therefore, brings additional barriers to entry for low-cost carriers.

To summarize, our prior discussion makes the argument that greater investments in infrastructure and the complexity of the hub-and-spoke system of network carriers imposes barriers to entry to low-cost carriers, and, consequently, lessens competition in many of the markets served by network carriers. This, in turn, gives rise to greater pricing power and better yield management for network carriers, resulting more persistent profit margins than low-cost carriers. Consistent with this reasoning, we present the following hypothesis:

> **H1:** Future-period profit margins are more strongly associated with current-period profit margins for network carriers than low-cost carriers.

3.2 Hypotheses concerning persistence among the individual components of profit margins

We next conjecture on whether and why the type of business model affects the relative persistence of the individual components of profit margins. Specifically, we argue that, because a firm must formulate an operational strategy consistent with the firm's business model, most managerial decisions and initiative are directed in support of the firm's strategy and such decisions should affect the individual components of profitability (revenues and costs) differently. Therefore, we should observe differences in level of persistence among the individual components of PM based on the two types of business models adopted by airlines. To test this conjecture, we decompose profit margins into the BDK/HDF revenue and expense components described earlier. Following the logic of BDK/HDF, we argue that "successful" initiatives, as measured by the earnings components, should breed success in the future. In other words, earnings in the future should be a function of actions taken in the present and the past. Hence, this linkage leads us to predict associations between the t-1 to t components (that reflect the success or failure of prior initiatives) and the period t+1 margins that benefit from the realization or culmination of those actions by management.

3.3 Persistence in the Revenue Components of Profit Margins

Holding a firm's product/service mix constant, changes in revenues are driven by changes in the firm's pricing policies and by changes in the quantity of output sold. Concerning pricing, we argue that, because network carriers cater their business models to market segmentation (e.g., leisure travelers, business travelers, high-end travelers), they engage heavily in price discrimination and are able to charge different airfares. This practice gives them added flexibility to adjust their fares according to the circumstances and demographics of the market, which suggests that any pricing innovations are more likely to persist. For example, network carriers could lower (increase) fares to fill more (less) seats in first class, or coach, depending on the stream of demand for each, thus managing their capacity and maximizing revenue yields. Further, because network carriers charge generally higher fares to business-class and first-class travelers, the price elasticity of demand in this segment may be relatively small, and, therefore, they are able to exercise a higher pricing power and achieve higher fare premiums (Berry, Carnall, and Spiller 1997). All of these factors may allow network carriers to manage their revenue stream more effectively. Because network carriers are able to segment their customer classes with more ease, we predict that they should exhibit higher persistence in revenues in future periods.

Moreover, we suggest that network carriers may have more persistent demand, given that a larger proportion of their passenger base is comprised of business travelers who tend to travel more frequently and with less advance notice, and who tend to be less price-conscious and more likely to pay fare premiums. This is in contrast to leisure travelers, who tend to be more price-conscious, who tend to travel less, and who are likely more able to take advantage of advance purchase requirements that often accompany low fare offerings. This persistence in demand for network carrier seats by business travelers has the potential to generate more permanent revenues for network carriers.[13]

In contrast, low-cost carriers are more likely to serve leisure and price-conscious travelers, and often employ simpler and more uniform pricing policies that reduce their ability to engage in significant price discrimination. As a result, they may have less flexibility to change prices and are not as innovative in pricing as network carriers. This may make it more difficult for low-cost carriers to manage their revenue streams and capacity in the face of transitory demand. Hence, we should expect low-cost carriers

[13] Prior academic research examining earnings persistence partitions income into permanent and transitory components and highlights the importance of permanent revenues in generating higher levels of earnings persistence (Ali and Zarowin 1992, Baginski *et al*. 1999).

to have lower persistence of revenues in future periods. Based on these arguments, we put forward this hypothesis:

H2: Future-period profit margins are more strongly associated with current-period revenue components for network carriers than low-cost carriers.

3.4 Persistence in the expense components of profit margins

We next examine the level of persistence in the expense components of profit margins. We conjecture that, given the emphasis by low-cost carriers' business models on offering low fares, low-cost carriers must keep their operating costs as low as possible. Consequently, their operational strategy and corporate culture is focused on strict cost management. As such, we hypothesize that low-cost carriers must be more adept and nimble in adjusting their costs to cope with variations in passenger demand. Also, because low-cost carriers tend to serve fewer routes, have smaller and less complex fleets, offer fewer flight and service amenities, and maintain lower levels of infrastructure, they tend to be leaner and have more flexibility to reduce costs as needed to accommodate any changes in demand. As a result, because of this flexibility, expense innovations should be less persistent for low-cost carriers.

On the other hand, network carriers may be less able to quickly adjust their operating costs compared to low-cost carriers (at least in the short run). Given their more expansive route structures and service levels, network carriers tend to maintain larger infrastructure levels irrespective of the amount of passenger volume. For instance, there could be an abrupt contraction in passenger demand and they would still have to maintain a hub for connecting passengers, would have to provide services and amenities to first-class passengers, and would have to service a greater number of destinations (domestically and internationally) relative to low-cost carriers. As a result, they would have more difficulty in adjusting (reducing) their operating costs in the short-run. Therefore, since their costs tend to be more "sticky" (Anderson, Banker and Janakiraman 2003), these expenses would tend to persist in future periods when compared to those of low-cost carriers.

We also suggest that network carriers tend to have higher degrees of operating leverage than low-cost carriers and this also hinders their ability to adjust costs swiftly to possible contractions in demand. More specifically, while low-cost carriers also invest in capacity, this capacity investment may be disproportionately in fleet assets as opposed to hub/gate assets. Network carriers have a much larger level of operating leverage for the various reasons enumerated earlier. The fact that they have to maintain higher capacity, fly more routes, and maintain hubs results in higher fixed costs, and consequently higher operating leverage. Consistent with this notion, we argue that greater operating leverage should exacerbate the persistence in costs (Lev 1983). As a result, network carriers should exhibit more persistent operating expenses than low-cost carriers. Based on these arguments of operating flexibility, cost stickiness and operating leverage, we present the following hypothesis:

> **H3:** Future-period profit margins are more strongly associated with current-period expense components for network carriers than for low-cost carriers.

4.0 Data and empirical methodology

4.1 Data and sample description

We build our sample based on data supplied by air carriers to the Bureau of Transportation Statistics (BTS). The BTS collects this data, including reported operational metrics, for U.S. airlines. Our sample includes quarterly and annual observations from the top seven *network* carriers and the top seven *low-cost* carriers based on the total revenue reported in 2006. Our sub-sample of network carriers includes Alaska, American, Continental, Delta, Northwest, United, and US Airways, and the sub-sample of low-cost carriers is comprised of AirTran, America West, ATA, Frontier, JetBlue, Southwest, and Spirit. All of airlines other than Spirit are publicly traded. We gather additional data on operating revenues, operating expenses, available seat-miles (*ASM*), and revenue passenger-mile (*RPM*), and other proxies from each firm's 10-K, 10-Q and/or 8-K filings using the SEC's Edgar files, or the company's website.[14] We adjusted total operating expenses for special items, restructuring charges, impairments, and government grants (Fairfield *et al*. 2009). We also had to deal with certain disclosure issues associated

[14] For the one sample firm not publicly traded (Spirit Air), all financial and operational data are obtained from the BTS Form 41 disclosures. Also, one firm, Frontier Airlines, reports a March 31 fiscal year end; hence, we align its quarterly/annual observations by year and quarter with those of the other sample firms.

with how airline companies' report their operating statistics (i.e., *RPM* and *ASM*) when they also operate regional carriers.[15] In addition, at various times during our sample period, several air carriers filed for and emerged from bankruptcy, merged operations, or suspended operations temporarily due to an air disaster. In these cases, we make all the necessary adjustments to the data. Our final sample consists of 590 quarterly-year observations and 135 firm-year observations covering the period from 1996 through 2008. The sample selection procedures are summarized in Table 2.

[Insert Table 2 here]

4.2 Model Description

First, following the methodology of Banker, Datar, and Kaplan (BDK1989) and Horngren, Datar, and Foster (HDF 2006), we decompose changes in revenues and changes in costs into components attributable to innovations in growth, price recovery (price changes in inputs and outputs), and productivity among the two groups of airlines. This decomposition utilizes two operational measures: *available seat-miles* (*ASM*; a capacity or input metric) and *revenue passenger-miles* (*RPM*; a capacity-utilization or output metric) to calculate both changes in revenues and changes in costs. For ease of exposition, we present the BDK/HDF components of changes in revenues ($\Delta REV = \Delta REV_{\text{Growth}} + \Delta REV_{\text{Price-recovery}}$) and changes in expenses ($\Delta EXP = \Delta EXP_{\text{Growth}} + \Delta EXP_{\text{Price-recovery}} + \Delta EXP_{\text{Productivity}}$) succinctly here. We refer the reader to the Appendix for a complete explanation of the respective derivations. Specifically, these are represented by Expressions (4) through (8), respectively, in the Appendix.

To test our hypotheses concerning the persistence of quarterly profit margins across business models, we use a variation of the seasonally differenced quarterly earnings model proposed by Foster (1977).[16] To examine the persistence of profit margins conditional on

[15] Tsoukalas *et al*. (2008) point out the need to reconcile operational data with financial data. For example, some carriers (e.g., Continental, Alaska) report their RPM and ASM separately for their mainline and regional operations. Often these firms would report separate line items in their consolidated financial statements for regional operating revenues and regional operating expenses. Under such circumstances, we are careful to ensure that the operating expenses reported in the consolidated financial statements were those associated with the reported RPM and ASM.

[16] Foster's (1977) Model 5 is specified as $E(Q_t) = Q_{t-4} + \varphi\,(Q_{t-1} - Q_{t-5}) + \delta$, where Q_t = earnings in quarter *t*, and δ represents an average drift term over the quarters in the sample. We modify Foster's (1977) Model 5 by re-characterizing the time periods, expanding the expression, substituting *PM* (where $PM_t = OI_t / REV_t$) for *Q*,

business model, we specify model (1) as follows:

$$PM_{t+1} = \beta_0 + \beta_1 PM_t + \beta_2 PM_{t-3} + \beta_3 PM_{t-4} + \beta_4 LOWCOST + \beta_5 (PM_t \times LOWCOST)$$
$$+ \beta_6 (PM_{t-3} \times LOWCOST) + \beta_7 (PM_{t-4} \times LOWCOST) + \beta_j (Controls) + \varepsilon$$

where *PM* represents profit margin and is measured as the ratio of operating income (*OI*) to total revenues (*REV)*, and *LOWCOST* is a dummy variable that is equal to 1 if the airline is a low-cost carrier, and 0 otherwise. We include several control variables (*Controls*), which could influence the relative persistence of future profit margins, including firm size (natural log of total revenues or total assets), market share (the square of the firm's proportion of the total number of passengers flown during the period), and capacity utilization (the ratio of *RPM* to *ASM*). We also included a number of additional indicator variables. First, to control for the contraction in air travel during the period following the U.S. terrorist attacks of September 11, we include a dummy variable set to 1 for Q4 2001, Q1 2002, Q2 2002, Q3 2002, zero otherwise. Second, to control for periods when a firm operated in bankruptcy, we include an indicator variable set to 1 when the firm was operating in bankruptcy, zero otherwise. Third, to control for the seasonal nature of air travel, we include quarterly indicators for quarters 1 through 3 (zero otherwise). Fourth, to control for changes in economy-wide demand for air travel over the 1996-2008 period, we include appropriate yearly indicator variables. Finally, we include firm dummy variables to control for firm effects. Given the above model, our hypothesis 1 leads us to predict $\beta_1 > 0$ and $\beta_5 < 0$. More specifically, $\beta_1 > 0$ implies current margins for network carriers persist in future margins. $\beta_5 < 0$ implies (where the persistence coefficient for low-cost carriers is $\beta_1 + \beta_5$) that margins are less persistence for low-cost carriers. Our results of estimating this model are reported in Table 7 and we defer the discussion of them until then.

To examine the level of persistence among the individual components of profit margins and test hypotheses two and three, we develop the following empirical model using expression (3) from the

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allowing the coefficients to vary over the quarterly components, and substituting an intercept for δ, obtaining the expression $E(PM_{t+1}) = \beta_0 + \beta_1 PM_t + \beta_2 PM_{t-3} + \beta_3 PM_{t-4} + \varepsilon$. Using this expression, we examine the relation between the quarterly components and one period-ahead profit margins by decomposing the PM_t term into the lagged term and the quarterly BDK/HDF components.

Appendix. Given $PM_{t} = PM_{t-1} + \Delta REV_{Growth} + \Delta REV_{Price\text{-}recovery} + \Delta EXP_{Growth} + \Delta EXP_{Price\text{-}recovery} + \Delta EXP_{Productivity}$ (where $PM_{t-1} = OI_{t-1} / REV_{t}$), we first obtain:

$$
\begin{aligned}
PM_{t+1} &= \beta_0 + \beta_1 (PM_{t-1} + \Delta REV_{Growth} + \Delta REV_{Price\text{-}recovery} + \Delta EXP_{Growth} \\
&\qquad + \Delta EXP_{Price\text{-}recovery} + \Delta EXP_{Productivity}) + \beta_2 PM_{t-3} + \beta_3 PM_{t-4} + \varepsilon \\
&= \beta_0 + \beta_1 PM_{t-1} + \beta_2 \Delta REV_{Growth} + \beta_3 \Delta REV_{Price\text{-}recovery} \\
&\qquad + \beta_4 \Delta EXP_{Growth} + \beta_5 \Delta EXP_{Price\text{-}recovery} + \beta_6 \Delta EXP_{Productivity} \\
&\qquad + \beta_7 PM_{t-3} + \beta_8 PM_{t-4} + \varepsilon
\end{aligned}
$$

This model allows us to assess the persistence of the BDK/HDF components for PM_{t+1} after controlling for the seasonal effects captured by PM_{t-3} and PM_{t-4} (Foster 1977). By adding *LOWCOST* and appropriate interactions of *LOWCOST* with the model variables, plus the control variables discussed previously, we obtain Model (2) as follows:

$$
\begin{aligned}
PM_{t+1} &= \beta_0 + \beta_1 PM_{t-1} + \beta_2 \Delta REV_{Growth} + \beta_3 \Delta REV_{Price\text{-}recovery} + \beta_4 \Delta EXP_{Growth} \\
&\quad + \beta_5 \Delta EXP_{Price\text{-}recovery} + \beta_6 \Delta EXP_{Productivity} + \beta_7 PM_{t-3} + \beta_8 PM_{t-4} + \beta_9 LOWCOST \\
&\quad + \beta_{10} (PM_{t-1} \times LOWCOST) + \beta_{11} (\Delta REV_{Growth} \times LOWCOST) + \beta_{12} (\Delta REV_{Price\text{-}recovery} \times \\
&\qquad LOWCOST) + \beta_{13} (\Delta EXP_{Growth}\ LOWCOST) + \beta_{14} (\Delta EXP_{Price\text{-}recovery} \times \\
&\qquad LOWCOST) + \beta_{15} (\Delta EXP_{Productivity} \times LOWCOST) + \beta_{16} (PM_{t-3} \times LOWCOST) + \beta \\
&\qquad {}_{17} (PM_{t-4} \times LOWCOST) + \beta_j (Controls) + \varepsilon
\end{aligned}
$$

Two important insights are apparent in this model. First, the revenue/expense nature of the BDK/HDF coefficients implies that the revenue components ΔREV_{Growth} and $\Delta REV_{Price\text{-}recovery}$ should carry positive signs and the expense components ΔEXP_{Growth}, $\Delta EXP_{Price\text{-}recovery}$, and $\Delta EXP_{Productivity}$ should carry negative signs. Second, note that the network carrier persistence coefficient for, say, ΔREV_{Growth} is β_2, while the same persistence coefficient for low-cost carriers would be $\beta_2 + \beta_{11}$. Hence, to validate H2 and H3, we expect $\beta_2 > 0$, $\beta_3 > 0$, $\beta_4 < 0$, $\beta_5 < 0$, and $\beta_6 < 0$ (coefficients associated with network carriers), and $\beta_{11} < 0$, $\beta_{12} < 0$, $\beta_{13} > 0$, $\beta_{14} > 0$ and $\beta_{15} > 0$ (coefficients associated with low-cost carriers).

We estimate all regressions using both quarterly and annual data.[17] Also, all the models are estimated using ordinary least-squares (with Newey-West robust standard errors), as well as generalized least-squares (GLS) using the Prais-Winsten approach to correct for any autocorrelation. We present our results in the tables with the GLS estimates.

5.0 Results

5.1 Descriptive Statistics

Table 3 reports quarterly financial and operational statistics for the entire sample and by type of carrier. Several interesting findings emerge from these results. As shown, the 14 airlines companies were profitable over the 1996-2008 period examined (i.e., *OI* /*TA* > 0). Operating yield (*REV* / *RPM*) averages around $0.135 per *RPM*, while operating expenses (*EXP* / *ASM*) averages $0.096 per *ASM*. Results not reported in tables indicate a growing market for air traffic over the period, both in terms of *ASM* and *RPM*. Not surprisingly, we find that network carriers are larger in terms of assets (*TA*), sales (*REV*), traffic levels (*ASM* and *RPM*), market share (market share index), and load factors (*RPM* / *ASM*); this reflects, among other things, the differences in operating strategy associated with the hub-and-spoke model typically adopted by network carriers and the point-to-point model typically adopted by low-cost carriers.

[Insert Table 3 here]

The results are also consistent with the dominance of the overall market by network carriers and with their ability to manage capacity and revenue yield through price discrimination. While there is no significant difference in *mean* quarterly profitability ratios (*OI* / *TA*) between network carriers and low-cost carriers, we find that the *median* profitability ratio for low-cost carriers is significantly higher than that for network carriers. Regarding revenue per passenger mile (*RPM)*, network carriers enjoy significantly higher mean yields relative to low-cost carriers (means of $0.1497 versus $0.1198,

[17] The key difference between the annual models and quarterly models is that the annual models incorporate no variables to control for the seasonality of margins, as such terms are not relevant for annual models.

respectively). This is also consistent with both pricing discrimination and with market dominance by network carriers. Regarding operating costs between the two groups of carriers, network carriers' operating costs averaged \$0.1090 per available seat miles (*ASM*) and those of low-cost carriers averaged \$0.0828; this difference is significant at any conventional level. These unit costs by business model are very similar to those reported by Tsoukalas *et al*. (2008; see their Figure 4).

[Insert Table 4 here]

Table 4 presents the Pearson correlations among all variables of interest. These results reveal a relatively high pairwise correlation (0.592) exists between the period *t PM* level and the period *t* + 1 level. Regarding the correlations between PM_{t+1} and the current-period BDK/HDF earnings components, we find that four of the five correlations between future margins and the components are significant at the 0.05 level. $\Delta REV_{\text{Growth}}$ and $\Delta REV_{\text{Price-recovery}}$ are positively associated with PM_{t+1}, suggesting that current sales growth and the ability to raise fares in the current period translate into higher future margins. On the other hand, $\Delta EXP_{\text{Productivity}}$ is negatively associated with PM_{t+1}, suggesting that improvements in load factors (which implies a favorable $\Delta EXP_{\text{Productivity}}$) are associated with higher future margins. Contrary to expectations, a positive pairwise correlation exists between PM_{t+1} and $\Delta EXP_{\text{Growth}}$, which implies that increases in operating expenses attributable to growth in output are associated with higher margins. However, since higher output is also associated with higher revenues, and airline companies carry high operating leverage in their cost structure, a potential effect of growth is to increase profit margins. The correlation between $\Delta EXP_{\text{Price-recovery}}$ and PM_{t+1} is not significant at conventional levels, but it does exhibit the expected negative sign. Consistent with general price elasticity for air travel, high operating leverage and pricing to recover costs, we observe significantly negative associations between $\Delta REV_{\text{Price-recovery}}$ and both airline load factors (*LF*) and $\Delta EXP_{\text{Productivity}}$. In other words, increases in airfares, as measured by $\Delta REV_{\text{Price-recovery}} > 0$, are associated with (1) lower load factors and (2) increases in unit operating expenses.

[Insert Table 5 here]

Table 5 reports descriptive statistics for *profit margins* measured over quarterly and annual periods. Over the entire 1996-2008 period, margins averaged 2.06 percent of quarterly sales, and 2.62 percent of annual sales. Both measures are significantly greater than zero. Both network and low-cost carriers were profitable, but did not differ in their relative profitability. Panel B indicates that margins are relatively higher in the second and third quarters; consistent with the effects of seasonality, demand for air travel rises during the summer months (second quarter) and then levels off in the fourth quarter. Panel B also reveals that, for the entire panel of firm-quarter observations, the second quarter tends to report the highest profit margins, while the fourth quarter tends to report the lowest.

[Insert Table 6 here]

Table 6 reports the statistics for the BDK/HDF earnings components both on a quarterly basis (Panels A, B and C) and on an annual basis (Panels D and E). Panel A reports that, on an overall quarterly basis, $\Delta REV_{\text{Growth}}$, $\Delta EXP_{\text{Growth}}$, and $\Delta EXP_{\text{Price-recovery}}$ are significantly greater than zero, while $\Delta REV_{\text{Price-recovery}}$ and $\Delta EXP_{\text{Productivity}}$ do not differ significantly from zero. The mean $\Delta REV_{\text{Growth}}$ and $\Delta EXP_{\text{Growth}}$ results are consistent with increasing *RPM* volume over the 1996-2008 period; i.e., increases in *RPM* had a favorable impact on revenues, and a correspondingly unfavorable impact on operating expenses. That mean $\Delta EXP_{\text{Price-recovery}}$ was significantly positive over the period implies that input unit costs generally increased over the period. This could be explained by, among other things, the dramatic increase in fuel costs since 2001, which has an unfavorable impact on operating expenses (and operating income). Panel B compares the mean component profiles between network carriers and low-cost carriers, and reveals only a difference in growth. Consistent with their smaller size and more focused competition, the low-cost firms, on average, grew at a faster rate than the network carriers. This faster growth has a relatively larger mean favorable impact on low-cost carrier revenues, but also a relatively larger mean unfavorable impact on their operating expenses.

As to the component characteristics by quarter (Panel C), the mean favorable (unfavorable) $\Delta REV_{\text{Growth}}$ ($\Delta EXP_{\text{Growth}}$) components in Q1 through Q3 are consistent with relative quarter-to-quarter growth in *RPM*, while the mean unfavorable (unfavorable) $\Delta REV_{\text{Growth}}$ ($\Delta EXP_{\text{Growth}}$) component in Q4 is consistent with a relative decline in output in the fourth quarter. The pattern of mean $\Delta REV_{\text{Price-recovery}}$

suggests fare increases in the first quarter and fourth quarters, and fare cuts in the second and third quarters. Unit-cost changes for inputs captured in mean/median $\Delta EXP_{\text{Price-recovery}}$ suggest relative unit-cost increases in Q1 and Q4, and a unit-cost decrease in Q2; these results are consistent with high fixed costs being spread over lower (higher) volumes in Q1 and Q4 (Q2). However, mean $\Delta EXP_{\text{Price-recovery}}$ does not differ reliably from zero in Q3. Regarding $\Delta EXP_{\text{Productivity}}$, depending on the test employed, the relative changes in load factors (i.e., capacity utilization) measured by the mean/median components suggest increases in load factors (reflected in negative components) occur in Q1-Q3, and a decline (reflected in a positive component) in Q4.

Panel D reports the summary statistics for the annual BDK/HDF measures. The interpretation of the numbers suggests that total revenues increased over the 13-year period by an average of 9.5 percent of sales due to *RPM* growth, and by 0.2 percent of sales because of overall fare increases. Total expenses increased, on average, by 9.4 percent of sales due to *RPM* growth, and by 1.5 percent due to unit input cost increases. However, expenses fell by an average of 1.4 percent of sales due to increased load factors over the same period. Qualitatively, the pattern of mean/median components is consistent with net growth in output (favorable mean $\Delta REV_{\text{Growth}}$, unfavorable mean $\Delta EXP_{\text{Growth}}$), relatively small increases in fares charged to passengers (favorable mean $\Delta REV_{\text{Price-recovery}}$), relative large increases in input unit costs (unfavorable mean $\Delta EXP_{\text{Price-recovery}}$), and a relative increase in load factors (favorable mean $\Delta EXP_{\text{Productivity}}$) over the 1996-2008 period. Panel E reports the comparisons of annual BDK/HDF components between network carriers and low-cost carriers. The patterns for both subsamples generally mirrored that of the sample as a whole. As in Panel B, network carriers and low-cost carriers differed operationally only in terms of growth rates. No other significant differences exist between the two subsamples with respect to price-recovery or productivity.

5.2   Regression Results

5.2.1 Profit margin persistence with quarterly data

Table 7 reports the results of our *PM* regressions of Models (1) and (2) for the pooled sample of firms on a quarterly basis (Panel A) and on an annual basis (Panel B). Both panels report the interactions of the model variables with the *LOWCOST* indicator to reveal the incremental impact of business model on *PM* and profitability component persistence. Panel A also reports the persistence patterns not only for period t +1, but for subsequent periods t + 2, t + 3, and t + 4.

[Insert Table 7 about here]

Regarding the estimation of Model 1 which includes profit margin for one period ahead (PM_{t+1}) as the dependent variable, and PM_t, PM_{t-3}, and PM_{t-4}, along with their interactions with *LOWCOST*, as explanatory variables, we find that both PM_t and PM_{t-3} are positively associated with PM_{t+1}. Consistent with prior research findings, these results suggest that current profitability tends to persist in future periods; in this particular case, future profit margins are highly correlated with current profitability (PM_t) and the seasonal component of profitability (captured by PM_{t-3}) for one quarter-ahead. In contrast, PM_{t-4} is negatively associated with PM_{t+1}, which suggests some level of mean reversion of margins as it is captured by the PM_{t-4} coefficient. Regarding our test of H1, whether the model chosen by airlines affects the persistence of profit margins, this is captured by the interaction terms involving *LOWCOST* with PM_t and PM_{t-3}. As predicted, the coefficient on this interaction is negative and significant for PM_t (model 1), and, although the respective coefficients PM_{t-1} through PM_{t-3}, are also negative, they are not always significant at conventional levels. Consistent with our prediction in H1, these results suggest that current profit margins are less persistent for low-cost carriers than network carriers~~.~~

Our next set of analyses involving Model 2 tests the predictions of H2 and H3. We decompose current profit margins (PM_t) into the sum of the prior-period operating income (PM_{t-1}) and the individual components of profit margins (ΔREV_{Growth}, $\Delta REV_{Price\text{-}recovery}$, ΔEXP_{Growth}, $\Delta EXP_{Price\text{-}recovery}$, and $\Delta EXP_{Productivity}$) and the associated interactions of these variables with *LOWCOST*. These results are reported in the same table (see Model 2). As shown, we find that, in the case of network carriers, all of the coefficients on the individual components of PM have the expected signs and are statistically significant at conventional levels. Specifically, the coefficients capturing changes in revenues (ΔREV_{Growth} and

$\Delta REV_{\text{Price-recovery}}$) are significantly positive, while those capturing changes in costs ($\Delta EXP_{\text{Growth}}$, $\Delta EXP_{\text{Price-recovery}}$ and $\Delta EXP_{\text{Growth}}$) are significantly negative. These results are consistent with the notion that innovations in output/input growth, input/output prices, and productivity individually affect the persistence in future profit margins, and, as such, provide empirical support that validates H2 and H3.

We interpret the underlying PM_{t+1} *network* carrier results of Panel A in Table 6 as follows. First, recall that the network carriers' business model is based on price discrimination among the different classes of travelers. Second, network carriers enjoy general market dominance on a system-wide basis, but also face intense competition with low-cost carriers in certain markets. Our network carrier results thus suggest more persistent revenue innovations (favorable and unfavorable) for these carriers. Second, the operational strategies typically followed by network carriers (i.e., the hub-and-spoke system and larger investments in infrastructure) make their operating costs "sticky," leading to more persistent costs.

Regarding the individual PM components for *low-cost* carriers, we find reliable evidence of lower persistence in future margins relative to network carriers. Regarding the revenue components, the coefficient on the interaction term involving $\Delta REV_{\text{Price-recovery}}$ is significantly negative, while that involving $\Delta REV_{\text{Growth}}$ carries a negative sign but does not differ reliably from zero. This result suggests that revenue innovations involving pricing changes are less persistent for low-cost carriers. This lower persistence likely is a function of several factors. First, low-cost carriers might raise or lower their pricing more quickly to reflect market conditions. Second, low-cost carriers likely serve relatively fewer business-class travelers and far fewer upscale travelers; these travelers have relatively lower demand elasticities to pricing changes and are more likely to fly on the network carriers. Finally, the low-cost carriers are more likely to tap into price-conscious, leisure-oriented consumer demand. We also find that the coefficients on the interaction terms involving $\Delta EXP_{\text{Price-recovery}}$ and $\Delta EXP_{\text{Productivity}}$ are both significantly positive. Given that the interactions capture the incremental effect of the low-cost business model on expense persistence, the positive sign has the effect of reducing the negative persistence coefficient on each of the expense components relative to network carriers. We interpret these results as reflecting the generally greater flexibility of the low-cost business model, which arises from the lower infrastructure investments, smaller fleet sizes, their use of a single type of aircraft, greater reliance on point-to-point route structures, and the ability to implement operational changes that could mitigate unfavorable input cost changes.

Interestingly, these results hold after controlling for seasonality and the effects of innovations captured by the PM_{t-1}, PM_{t-3}, and PM_{t-4} coefficients, and for size and other firm- and time-period specific factors (most of the coefficients on these measures are not reported). The significance of these controls provides us with some assurance that our regression results can be attributed to differences in business models. The additional controls also help rule out alternative explanations for the persistence of the revenue and expense components in future margins.

5.2.2 Quarterly analyses with two-, three- and four period-ahead margins

We also examine whether the results documented above hold in future quarters. Specifically, we re-estimate Models 1 and 2 using separate regressions for PM_{t+2}, PM_{t+3} and PM_{t+4} as dependent variables. These results are reported in Table 7 (Columns 4 through 9), Panel A. In general, and perhaps not surprisingly, the explanatory power of the models falls as the horizon quarter is extended. Further, the magnitude of the coefficients and the strength of the statistical significance of the lagged margins and the profitability components PM measure for the network carriers decline over these periods. This is consistent with component and margin persistence over time for the network carriers. Interestingly, for the low-cost carriers, the interaction terms quickly fall from statistical significance after one period, suggesting little or no difference between network carriers and low-cost carriers after two subsequent periods.

5.2.3 Profit margin persistence with annual data

Panel B of Table 7 reports the estimation of models (1) and (2) using annual observations. Interestingly, while we observe that PM_t, PM_{t-1}, and three of the BDK/HDF are associated with future margins for network carriers, we observe only one significant interaction involving the low-cost carriers.

This set of results show that there is relatively little difference in the level of PM persistence between network carriers and low-cost carriers when examined over annual periods. The one significant difference involves $\Delta EXP_{\text{Productivity}}$; innovations involving low-cost carrier capacity utilization are less persistent for future margins relative to network carriers. We interpret this result to suggest that low-cost carriers may be able to more quickly adjust their operating capacity levels to cope with changes in demand relative to network carriers. Interestingly, while the magnitudes of the interaction terms involving growth components are rather large, they are not significant at conventional levels. Closer examination of these two results suggests that the very high correlation between $\Delta REV_{\text{Growth}}$ and $\Delta EXP_{\text{Growth}}$ could be inflating the standard errors of the coefficients.

5.3 Sensitivity tests

To check the robustness of our regression results and rule out other alternative explanations or confounding effects, we perform the following tests First, we assess the sensitivity of our results to changes in the purchasing power of the dollar by adjusting all financial data for inflation, using the Consumer Price Index, with 2008 as the base year. We find our results virtually unchanged from those reported in tables after accounting for the effect of inflation. Second, we re-estimated our regressions with a Fama-McBeth (1973) approach. Specifically, we estimate separate quarterly regressions by year (for those years with sufficient data), average the resulting coefficients, and compute t-statistics for the means of the parameter estimates. The resulting means of the annual regressions carry the expected signs, but they are somewhat smaller in magnitude compared to those reported in the paper. Still, similar significance levels are observed. Finally, because the relative persistence of revenues could potentially be driving our results, we re-estimated our profit margin models using assets as the deflator rather than revenues. The results reported in the paper are generally robust to the change. However, the growth components ($\Delta REV_{\text{Growth}}$ and $\Delta EXP_{\text{Growth}}$) were not significant at conventional levels when the BDK/HDF profit margin components are deflated by assets.

6. Conclusion

The general supposition that the relative persistence of profit margins is conditional on a firm's business model is an issue that has raised debate among accounting researchers. Yet surprisingly little prior research has explored this link empirically. Using data from U.S. airlines, we investigate the potential role that a firm's competitive strategy/business model has on the persistence of profit margins. We next offer conjectures on whether and why the type of business model affects the relative persistence among the individual components of profit margins. Specifically, we argue that, because a firm must formulate an operational strategy that is consistent with the firm's business model, most managerial decisions are directed in support of the firm's strategy and such decisions should affect the individual components of profitability (revenues and costs). Therefore, given the differences in business models, we should observe differences in the level of persistence among the individual components of PM based on the two types of business models adopted by airlines. To test this conjecture, we decompose profit margins using a framework developed by Banker, Datar, and Foster (1989) and Horngren, Foster, and Datar (2006).

First, we show empirically that business model influences margin persistence, with business models focusing on low costs (low-cost carriers) reporting higher but less persistent margins compared to businesses focusing on differentiated product offerings (network carriers). Second, we use the BDK/HDF strategic profitability analysis methodology and the resulting profitability components to provide insights into how business model influences margin persistence. Finally, we show that the profitability components differ in their individual persistence, with (1) the revenue components associated with pricing policy, and (2) expense components associated with operational flexibility tending to drive this differential persistence.

Our study contributes to the accounting literature in at least two ways. First, to the best of our knowledge, this is the first study that documents empirically how a firm's competitive strategy influences the behavior of future profitability. Thus, our findings provide initial evidence demonstrating that a firm's competitive strategy is an important determinant in the persistence of profit margins. Second, our study also sheds light as to how decomposing profit margins into revenue and expense components is useful in explaining the importance of strategic execution and business model implementation in a relative large-scale industry-specific study. As argued by BDK and HDF and as documented in our study and those of others (e.g., Bailey et al. 2009, Mudde and Sopariwala 2008), standard management accounting tools are potentially useful in assessing this strategic execution.

Not surprisingly, several caveats apply to our study. First, our focus on the airline industry limits the generalizability of our results, and the business model distinction may be proxying for managers' decisions and operating choices with significant error. However, we feel that our study could be replicated in other industry settings. As BDK and HDF point out, computing the profitability components requires operational data on inputs and outputs, as well as revenue and expense data. Such data are often available in other industries. Hospitals and other health care settings represent at least one possibility, given the richness of the data that are generally publicly available. Second, we focus on only two operational measures to compute our profitability components. Increasing the number of operational measures would potentially capture relevant differences in profitability components, but we also suggest that there is a potential loss of comparability across firms due to differences in how each classifies its costs. Third, to the extent that output levels and input levels are jointly determined, our analyses are subject to some degree of endogeneity bias. Incorporating capacity measures and capacity utilization as variables of interest and as control variables suggests these factors are not driving our results, but the concern is not eliminated.

References

Ali, A., and P. Zarowin. 1992. Permanent versus transitory components of annual earnings and estimation error in earnings response coefficients. *Journal of Accounting and Economics* 15 (2-3): 249-264.

Anderson, M. C., R. D. Banker, and S. N. Janakiraman. 2003. Are selling, general, and administrative costs "sticky"? *Journal of Accounting Research* 41(1): 47-63.

Baginski, S., K., L. Lorek, G.L. Willinger, and B. Branson. 1999. The relationship between economic characteristics and alternative annual earnings persistence measure. *The Accounting Review* 74 (1): 105-120.

Baginski, S., K. Lorek, and G.L. Willinger. 1993. Economic determinants of quarterly earnings data. *Quarterly Review of Economics and Finance* 33:87-100

Bailey, C. D., A. Collins, D. Collins and K. Lambert. 2009. An analysis of Southwest Airlines: Applying the Horngren, Datar and Foster (2006) strategic profitability analysis approach. *Issues in Accounting Education* 24(4): 539-551.

Banker, R. D., H. Chang, and S. K. Majumdar. 1993. Analyzing the underlying dimensions of firm profitability. *Managerial and Decision Economics* 14(1): 25-36.

Banker, R. D., S. M. Datar, and R. S. Kaplan. 1989. Productivity measurement and management accounting. *Journal of Accounting, Auditing and Finance* 4(4): 528-554.

Banker, R.D., R. Mashruwala, and A. Tripathy. 2010. Generic strategies and sustainability of financial performance. *Unpublished Working Paper*.

Ben-Yosef, Eldad. 2005. *The Evolution of the US Airline Industry: Theory, Strategy, and Policy*, Springer, The Netherlands.

Berry, S., M. Carnall, and P.T. Spiller. 1996. Airlines hubs: costs, markups, and the implications of consumer heterogeneity, *NBER Working paper*.

Brown, L.D., and J. Han. 2000. Do stock prices fully reflect the implications of current earnings for future earnings for AR1 firms? *Journal of Accounting Research* 38 (1): 149-164.

Brown, L.D., and M. Rozeff. 1979. Univariate time-series models of quarterly accounting earnings per share: A proposed model. *Journal of Accounting Research* 17 (1): 179-189.

Bureau of Transportation Statistics. 2006. Found at http://www.bts.gov/press_releases/2006/bts024_06/html/bts024_06.html.

Bureau of Transportation Statistics. 2007. Found at http://www.bts.gov/press_releases/2007/bts012_07/html/bts012_07.html.

Collins D., and S.P. Kothari. 1989. An analysis of intertemporal and cross-sectional determinants of earnings, response, coefficients. *Journal of Accounting and Economics* 11: 143-182.

Cubbin, J., and P. Geroski. 1987. The convergence of profits in the long run: inter-firm and inter-industry comparisons. *The Journal of Industrial Economics* 35 (4): 427-442.

David, J.S., Y. Hwang, B.K. Pei, and W. Reneau. 2002. The performance effects of congruence between product competitive strategies and purchasing management design. *Management Science* 48: 866-886.

Easton, P. D., M. L. McAnally, P. Fairfield, X. Zhang, and R. F. Halsey. 2010. *Financial Statement Analysis & Valuation*, 2nd edition, Cambridge Business Publishers.

Easton, P., and M. Zmijewski. 1989. Cross sectional variation in the stock market response to accounting earnings announcements. *Journal of Accounting and Economics* 11: 117-142.

Fairfield, P. M., K. A. Kitching, and V. W. Tang. 2009. Are special items informative about future profit margins? *Review of Accounting Studies* 14 (2-3): 204-236.

Foster, G. 1977. Quarterly accounting data: time-series properties and predictive-ability results. *The Accounting Review* 52: 1-21.

Gillen, D., and A. Lall. 2004. Competitive advantage of low-cost carriers: Some implications for airports. *Journal of Air Transport Management* 10: 41-50.

Grant, R.M.1991. The resource-based theory of competitive advantage: implications for strategy formulation. *California Management Review* 33 (3): 114-135.

Grant, R.M. 2008. *Contemporary Strategy Analysis*, 6th edition, Blackwell Publishing, Oxford, U.K.

Horngren, C. T., S. M. Datar, and G. Foster. 2006. *Cost Accounting: A Managerial Emphasis*, 12th edition, Pearson Education, Upper Saddle River, New Jersey.

Kaplan, R., and D.P. Norton. 2001. Transforming the balanced scorecard from performance measurement to strategic management: part I. *Accounting Horizons* 15(1): 87-104.

Kormendi, R. and R. Lipe. 1987. Earnings innovations, earnings persistence and stock returns. *Journal of Business* 60: 323-345.

Kothari, S.P. 1992. Price-earnings regressions in the presence of prices leading earnings: Earnings level versus change specifications and alternative deflators. *Journal of Accounting and Economics* 15 (2-3): 173-202.

Langfield-Smith, K. 1997. Management control systems and strategy: A critical review. *Accounting, Organizations, and Society* 22(2): 202-232.

Langfield-Smith, K. 2006. A review of quantitative research in management control systems and strategy. Handbooks of Management Accounting Research (2): 753-783.

Lev, B. 1983. Some economic determinants of time-series properties of earnings. *Journal of Accounting and Economics* 5: 31-48.

Malone, T. W., P. Weill, R. K. Lai, V. T. D'Urso, G. Herman, T. G. Apel and S. L. Woerner. Do some business models perform better than others? MIT Sloan Working Paper 4615-06. Found at http://ssrn.com/abstract=920667.

Miles, R. and C. Snow 1978. *Organizational Strategy, Structure, and Process*, McGraw-Hill, New York.

Miller, D. 1987. The structural and environmental correlates of business strategy. *Strategic Management Journal* 8(1): 55-76.

Miller, D. 1988. Relating Porter's business strategies to environment and structure: analysis and performance implications. *Academy of Management Journal* 31(2): 280-308.

Mintzberg, H. 1978. Patterns of Strategy Formulation. *Management Science* 24: 934-948.

Mintzberg, H. 1987. Crafting strategy. *Harvard Business Review* 65 (July-August).

Morrison, S.A., and C. Wilson. 1995. *The Evolution of the Airline Industry*. Brookings Institution, Washington D.C.

Mudde, P. A., and P. R. Sopariwala. 2008. Examining Southwest Airlines' strategic execution: A strategic variance analysis. *Management Accounting Quarterly* 9(4). Found at https://www.imanet.org/publications_maq_back_issue_summer2008.asp.

Mueller, D. C. 1977. The persistence of profits above the norm. *Economica* 44: 380-391.

Nannes, J. M. 2000. Statement before the Judiciary Committee of the U. S. House of Representatives, June 14, 2000. U. S. Department of Justice. Found at http://www.justice.gov/atr/public/ testimony/4956.pdf.

Porter, M.E. 1980. *Competitive Strategy*, Free Press, New York.

Porter, M.E. 1985. Competitive Advantage, Free Press, New York.

Porter, M.E. 1996. What is Strategy? *Harvard Business Review* 75 (November-December): 59-79.

Scherer, R.M. 1973. *Industrial Market Structural and Economic Performance*, Rand McNally, Chicago, Illinois.

Soliman, M. T. 2008. The use of DuPont analysis by market participants. *The Accounting Review* 83(3): 823-853.

Stigler, G.J. 1963. *Capital and Rates of Returns in Manufacturing Industries.* Princeton University Press, Princeton, New Jersey.

Appendix

The Banker, Datar and Kaplan (1989; BDK) methodology, as operationalized in Horgren, Datar and Foster (2006; HDF), allows us to decompose changes in sales, operating expenses, and operating earnings into components attributable to growth, price-recovery and productivity. This decomposition allows us to examine more closely the operating results of the firm, and, as HDF point out, to assess the success of strategic initiatives.

If we denote operating income as *OI*, then the change in earnings from one period to the next can be expressed as follows:

$$\Delta OI = \Delta REV - \Delta EXP \qquad (1)$$

where ΔREV = the change in operating revenues from the prior period to the current period, and ΔEXP = the change in operating expenses over the same period. Note that, according to BDK/HDF, the change in revenues can occur because of one or both of the following reasons:

1. Changes in the quantity of output sold.

2. Changes in the prices charged for the output.

Changes in expenses can occur because any or all of the following reasons:

1. Changes in the quantity of output (inputs change linearly with output)

2. Changes in the prices paid for the inputs.

3. Changes in how the inputs are used.

This implies that the change in revenues consists of a component attributable to changes in output quantity and a component attributable to output price changes. Similarly, the change in expenses consists of a component attributable to changes in output quantity, a component attributable to input price changes, and a component associated with changes in productivity. This suggests the following relation holds:

$$\Delta OI = \Delta REV - \Delta EXP = (\Delta REV_{\text{Growth}} + \Delta REV_{\text{Price-recovery}}) - (\Delta EXP_{\text{Growth}} + \Delta EXP_{\text{Price-recovery}} + \Delta EXP_{\text{Productivity}}) \quad (2)$$

where $\Delta REV_{\text{Growth}}$ is the change in revenue attributable to changes in output sold, $\Delta REV_{\text{Price-recovery}}$ is the change in revenue due to changes in output prices, $\Delta EXP_{\text{Growth}}$ is the change in expenses due to growth in output, $\Delta EXP_{\text{Price-recovery}}$ is the change in expenses due to changes in input prices, and $\Delta EXP_{\text{Productivity}}$ is the change in expenses due to changes in the utilization of productive assets. From the above, we can link earnings in the prior period with earnings in the current period as follows:

$$OI_{t-1} + (\Delta REV_{\text{Growth}} + \Delta REV_{\text{Price-recovery}}) - (\Delta EXP_{\text{Growth}} + \Delta EXP_{\text{Price-recovery}} + \Delta EXP_{\text{Productivity}}) = OI_{t}. \quad (3)$$

We next turn our attention to deriving the components described above. Applying the HDF methodology, the **growth component** captures the impact on an airline's operating income that is attributable solely to changes in the quantity of output sold by the airline during the period examined. We proxy for output by measuring a firm's *revenue passenger-mile* (*RPM*), a common operating metric reported by virtually all airline companies we have examined. Regardless of the strategy adopted by management, an airline firm's mission typically involves increasing its sales. Holding everything else constant, growth in output should have a favorable effect on operating income. The *revenue effect of growth* ($\Delta REV_{\text{Growth}}$) from period t - 1 to period t is:

$$\Delta REV_{\text{Growth}} = (ACT\_RPM_{\,t} - ACT\_RPM_{\,t\text{-}1}) \times (REV_{\,t\text{-}1} / ACT\_RPM_{\,t\text{-}1}), \tag{4}$$

where $ACT\_RPM_{\,t\,(t\text{-}1)}$ = the actual revenue passenger-mile output in period t (t - 1); and $REV_{\,t\,(t\text{-}1)}$ = total operating revenues in period t (t - 1). $\Delta REV_{\text{Growth}} > 0$ ($\Delta REV_{\text{Growth}} < 0$) implies that, all else equal, total revenues increased (decreased) due to increases (decreases) in output over the prior period.

The *cost effect of growth* ($\Delta EXP_{\text{Growth}}$) component focuses on the effect of growth on input usage holding input prices and productivity constant. Rather than focusing on the different expense categories and operating statistic disclosures used by airline companies and attempting to map expenses to operating metrics, we instead capture differences in inputs with *available seat-miles* (*ASM*). This aggregate input measure captures differences in airline scale and scope, airplane capacity, stage length, destinations and employee levels and expresses them in a single input measure. This measure is so prevalent in the industry that analysts and firms both report their operating expenses on a per-*ASM* basis. Based on using this single aggregate input measure, the expression used to compute the cost effect of growth for period t can be stated as:

$$\Delta EXP_{\text{Growth}} = (EXPEC\_ASM_{\,t\text{-}1} - ACT\_ASM_{\,t\text{-}1}) \times (EXP_{\,t\text{-}1} / ASM_{\,t\text{-}1}), \tag{5}$$

where $EXPEC\_ASM_{\,t\text{-}1}$ = expected available seat-miles of capacity required to generate period t *RPM* in period t- 1; $ACT\_ASM_{\,t\text{-}1}$ = actual available seat-miles of capacity flown to generate period t - 1 *RPM* in period t - 1; and $EXP_{\,t\text{-}1}$ = total operating expenses in period t - 1. $EXPEC\_ASM_{\,t\text{-}1}$ reflects the available seat-miles that the firm would be expected to fly in period t - 1 if *ACT_RPM* in period t - 1 was $ACT\_RPM_{\,t}$ instead of $ACT\_RPM_{\,t\text{-}1}$, *and its ratio of output to input remained constant*. $EXPEC\_ASM_{\,t\text{-}1}$ is thus computed as $[(ACT\_RPM_{\,t} / ACT\_RPM_{\,t\text{-}1}) \times ACT\_ASM_{\,t\text{-}1}]$. $\Delta EXP_{\text{Growth}} > 0$ ($\Delta EXP_{\text{Growth}} < 0$) implies that, all else equal, total expenses increased (decreased) due to increases (decreases) in output. The assumed linear production technology suggests a mechanical linkage between $\Delta REV_{\text{Growth}}$ and $\Delta EXP_{\text{Growth}}$. For example, if the firm achieves higher output relative to the prior period, this will result in a positive, favorable $\Delta REV_{\text{Growth}}$. But since *EXPEC_ASM* increases proportionately with increases in *RPM*, this automatically results in a positive, unfavorable $\Delta EXP_{\text{Growth}}$.

The **price-recovery component** captures the effect on an airline's operating income attributable solely to changes in the prices the airline charges for its output and the prices it pays for its inputs. To the extent that a given airline company can raise its fares on a percentage basis faster than the growth in input prices, this would impact favorably on operating income. On the other hand, attempting to increase volume by offering lower fares could result in reduced earnings, holding everything else constant. A similar effect would occur if the airline company chooses to forgo fare increases even as input prices increase. The expression used to compute the *revenue effect of price-recovery* ($\Delta REV_{\text{Price-recovery}}$) for period t is given as:

$$\Delta REV_{\text{Price-recovery}} = [(REV_{\,t} / ACT\_RPM_{\,t}) - (REV_{\,t\text{-}1} / ACT\_RPM_{\,t\text{-}1}]) \times ACT\_RPM_{\,t} \tag{6}$$

where *REV* and *ACT_RPM* are as previously defined, and the ratio of the two represents the "selling price" per revenue passenger-mile. $\Delta REV_{\text{Price-recovery}} > 0$ ($\Delta REV_{\text{Price-recovery}} < 0$) implies that, all else equal, total revenues increased (decreased) due to increases (decreases) in output prices.

The expression used to compute the *cost effect of price-recovery* ($\Delta EXP_{\text{Price-recovery}}$) for a period t captures the impact of changes in cost per *ASM*, after adjusting for growth and productivity changes. The expression is given as:

$$\Delta EXP_{\text{Price-recovery}} = [(EXP_t / ACT\_ASM_t) - (EXP_{t-1} / ACT\_ASM_{t-1})] \times EXPEC\_ASM_{t-1} \quad (7)$$

where EXP = total operating expenses in period t ($t - 1$), and ACT_ASM and $EXPEC\_ASM$ are as previously defined. $\Delta EXP_{\text{Price-recovery}} > 0$ ($\Delta EXP_{\text{Price-recovery}} < 0$) implies that, all else equal, total expenses increased (decreased) due to increases (decreases) in input prices.

Finally, the **productivity component** captures the change in an airline company's operating profit attributable to the productive use of inputs to lower costs. Given the emphasis on a single input measure, *ASM*, productivity is captured by the difference between actual *ASM* supplied versus the expected *ASM*. This implicitly assumes a constant load factor given the prior period relation between in the load factor metric reported by airline companies. A firm successfully competing on the basis of cost leadership should be able to increase output holding inputs constant, to use fewer inputs to achieve the same level of output, or some combination of the two. Based on using the single aggregated input measure, the expression used to compute the *cost effect of productivity* ($\Delta EXP_{\text{Productivity}}$) for period t can be expressed as:

$$\Delta EXP_{\text{Productivity}} = (ACT\_ASM_t - EXPEC\_ASM_{t-1}) \times (EXP_t / ACT\_ASM_t), \quad (8)$$

where ACT_ASM, $EXPEC\_ASM$, and EXP are as previously defined. $\Delta EXP_{\text{Productivity}} > 0$ ($\Delta EXP_{\text{Productivity}} < 0$) implies that, all else equal, total expenses increased (decreased) due to less efficient (more efficient) utilization of inputs. In other words, if $ACT\_ASM_t - EXPEC\_ASM_{t-1} > 0$ (< 0), this implies that the actual ASM (the input) required to produce the period t RPM (the output) was higher (lower) than expected.

Note that $\Delta EXP_{\text{Productivity}}$ implicitly controls for capacity utilization, which is important for analyzing an industry that is very heavily invested in capacity assets. The key metric for capacity utilization in the domestic airline industry is *load factor* (*LF*). The industry defines *load factor* as the ratio of revenue passenger-miles to available seat-miles. If we recognize that $ACT\_RPM_{t\,(t-1)} / ACT\_ASM_{t\,(t-1)}$ equals the load factor (LF) for the airline company in period t ($t - 1$), and subject expression (8) to some additional rearrangement of terms, the following expression for $\Delta EXP_{\text{Productivity}}$ can be derived:

$$\Delta EXP_{\text{Productivity}} = [1 - (LF_t / LF_{t-1})] \times EXP_t. \quad (9)$$

This expression implies that $\Delta EXP_{\text{Productivity}}$ equals the operating expenses in period t adjusted by the growth in load factors from period $t - 1$ to period t. It is thus clear that if capacity utilization, as measured by the load factor, increased (decreased) from period $t - 1$ to period t, then $\Delta EXP_{\text{Productivity}} < 0$ ($\Delta EXP_{\text{Productvity}} > 0$), which has a favorable (an unfavorable) effect on operating income.

Table 1 **Variable Definitions**	
Operational Variables	
ASM	*Available Seat-Miles*, the number of seats available multiplied by the number of miles flown (figures provided by the Bureau of Transportation Statistics).
RPM	*Revenue Passenger-Miles*, the number of revenue-paying passengers multiplied by the number of miles flown (figures provided by the Bureau of Transportation Statistics).
Operating Yield	Operating Revenues ÷ Revenue Passenger-Miles.
Load Factor	Revenue Passenger-Miles ÷ Available Seat Miles.
Financial Variables	
PM	*Profit Margin,* calculated as Operating Income ÷ Operating Revenues.
OI	*Operating Income,* calculated as Operating Revenues – Operating Expenses.
REV	*Revenues,* total operating revenues in the corresponding period.
EXP	*Operating Expenses,* excludes special items, restructuring charges, impairments.
ΔREV	*Change in Operating Revenues*, calculated as Revenue Effect of Growth *(REG)* + Revenue Effect of Price-Recovery *(RER).*
ΔEXP	*Change in Operating Expenses*, calculated as Cost Effect of Growth *(CEG)* + Cost Effect of Price Recovery *(CER)* + Cost Effect of Productivity *(CEP).*
Estimated Variables	
$\Delta REV_{\text{Growth}}$	*Revenue Effect of Growth*, calculated as (Revenue Passenger Miles$_t$ – Revenue Passenger Miles$_{t-1}$) x (Total Operating Revenues ÷ Revenue Passenger Miles$_{t-1}$).
$\Delta REV_{\text{Price-recovery}}$	*Revenue Effect of Price-Recovery,* calculated as [(Operating Revenues$_t$ ÷ Actual Revenue Passenger-Miles$_t$) – (Operating Revenues$_{t-1}$÷ Actual Revenue Passenger-Miles$_{t-1}$)] x Actual Revenue Passenger-Miles$_t$.
$\Delta EXP_{\text{Growth}}$	*Cost Effect of Growth*, calculated as (Expected Available Seat-Miles required to generate Revenue Passenger-Miles in period t – Actual Available Seat Miles required to generate Revenue Passenger-Miles in period t-1) x (Total Operating Expenses$_{t-1}$÷ Available Seat Miles in period$_{t-1}$).
$\Delta EXP_{\text{Price-recovery}}$	*Cost Effect of Price Recovery*, calculated as [(Total Operating Expenses$_t$ ÷ Actual Available Seat-Miles$_t$) – (Total Operating Expenses$_{t-1}$÷ Actual Available Seat-Miles$_{t-1}$)] x Expected Available Seat-Miles$_{t-1}$.
$\Delta EXP_{\text{Productivity}}$	*Cost Effect of Productivity*, calculated as (Actual Available Seat Miles required to generate Revenue Passenger-Miles in period t – Expected Available Seat-Miles required to generate Revenue Passenger-Miles in period t-1) x Total Operating Expenses$_t$ ÷ Actual Available Seat Miles required to generate Revenue Passenger-Miles in period t).
ACT_RPM	*Actual Revenue Passenger-Miles*, calculated as the number of revenue-paying passengers multiplied by the number of miles flown in the corresponding period.
ACT_ASM	*Actual Available Seat-Miles*, calculated as the number of seats available multiplied by the number of miles flown in the corresponding period.
EXPEC_ASM	*Expected Available Seat-Miles of capacity*, calculated as [(Actual Revenue Passenger-Miles$_t$ ÷ Actual Revenue Passenger-Miles$_{t-1}$) x (Actual Available Seat-Miles$_{t-1}$)].

Table 2
Sample Selection

		Number of Firm-Quarter Observations
Possible Firm-Quarter Observations (14 firms x 13 years x 4 quarters)		728
Less:	Data loss from lagging (4 quarters per firm)	56
	No data available, bankruptcy/liquidation/suspension of operations	38
	Uncertain treatment of regional operations*	42
	Extreme observations**	2
Subtotal of firm-quarter observations lost		154
Available firm-quarter observations		590

* – We lose firm-quarter observations either because it was impossible to determine whether reported operating revenues and expenses included or excluded the results of affiliated regional carriers, or because it was unclear whether the operating statistics included or excluded the results of affiliated regional carriers.
** – Two early quarters for JetBlue (from 2000, JetBlue's inaugural year) are excluded because they reported *RPM* and *ASM* growth rates in excess of 100 percent (or more than 10 standard deviations from the mean). This resulted in extreme observations for $\Delta REV_{\text{Growth}}$ and $\Delta EXP_{\text{Growth}}$. Inclusion of these observations in our model estimations yields results that are very similar to those reported in the tables.

Table 3

Quarterly Descriptive Statistics for the period of 1996 –2008					
Panel A – Overall (all 656 available observations)					
	Mean	Std Dev	Q1	Median	Q3
TA_t ($ in millions)	8,964	9,453	900	5,081	14,202
REV_t ($ in millions)	1,783	1,693	289	996	3,259
Number of passengers (annual)	39,704	32,638	8,950	38,780	67,362
EXP_t ($ in millions)	1,747	1,680	281	996	3,111
ASM_t (in millions)	16,772	15,102	3,498	11,381	28,089
RPM_t (in millions)	12,460	11,393	2,525	7,288	21,919
RPM_t / ASM_t (load factor)	0.7285	0.0672	0.6892	0.7293	0.7763
OI_t / TA_t	0.0051†	0.0339	-0.0079	0.0077*	0.0235
REV_t / RPM_t ($)	0.1351	0.0232	0.1215	0.1361	0.1506
EXP_t / ASM_t ($)	0.0962	0.0193	0.0810	0.0952	0.1090
Panel A – Network Carriers (335 available observations)					
TA_t ($ in millions)	**15,265**	8,941	8,379	**13,350**	22,881
REV_t ($ in millions)	**3,029**	1,459	2,052	**3,179**	4,152
Number of passengers (annual)	**58,806**	26,236	42,303	**55,811**	81,384
Market share index	**100.38**	77.17	41.70	**78.80**	165.63
EXP_t ($ in millions)	**2,986**	1,459	2,051	**3,053**	4,057
ASM_t (in millions)	**27,557**	13,192	17,686	**26,861**	38,778
RPM_t (in millions)	**20,611**	10,048	12,890	**21,625**	28,448
RPM_t / ASM_t (load factor)	**0.7410**	0.0542	0.6972	**0.7381**	0.7802
OI_t / TA_t	0.0058†	0.0197	-0.0069	**0.0061***	0.0200
REV_t / RPM_t ($)	**0.1497**	0.0162	0.1388	**0.1479**	0.1559
EXP_t / ASM_t ($)	**0.1090**	0.0148	0.0978	**0.1075**	0.1164
Panel C – Low-Cost Carriers (321 available observations)					
TA_t ($ in millions)	**2,388**	3,813	373	**870**	2,092
REV_t ($ in millions)	**484**	572	120	**278**	578
Number of passengers (annual)	**19,492**	25,940	4,083	**8,624**	20,016
Market share index	**23.61**	49.04	0.42	**1.81**	9.13
EXP_t ($ in millions)	**454**	522	119	**263**	561
ASM_t (in millions)	**5,516**	6,027	1,429	**3,474**	6,837
RPM_t (in millions)	**3,952**	4,260	1,057	**2,499**	5,127
RPM_t / ASM_t (load factor)	**0.7155**	0.0764	0.6643	**0.7169**	0.7663
OI_t / TA_t	0.0044	0.0441	-0.0088	**0.0098***	0.0272
REV_t / RPM_t ($)	**0.1198**	0.0193	0.1053	**0.1210**	0.1324
EXP_t / ASM_t ($)	**0.0828**	0.0136	0.0750	**0.0809**	0.0896

Bold numbers indicate a statistically significant difference ($p \leq 0.05$) exists between means (medians) for network carriers and low-cost carriers for the selected metric. *TA* is total assets at the end of quarter *t*. *REV* is total operating revenues in quarter *t*. *EXP* is total operating expenses (adjusted for special items), and *OI* = *REV* – *EXP*. *ASM* is total available seat-miles in quarter *t*; *RPM* is total revenue passenger-miles in quarter *t*. Market share index is defined as the square of the firm's share of the total passengers enplaned during the period. † (*) indicates that the reported mean (median) of the measure is significantly different from zero at the $p \leq 0.05$ level.

Table 4
Quarterly Descriptive Statistics – Pearson Correlations
1996 - 2008 (n = 590)

	PM_{t}	$PM_{t\text{-}1}$	$\Delta REV_{\text{Growth}}$	$\Delta REV_{\text{Price-recovery}}$	$\Delta EXP_{\text{Growth}}$	$\Delta EXP_{\text{Price-recovery}}$	$\Delta EXP_{\text{Productivity}}$	$\ln(REV_{t})$	$\ln(TA_{t})$	LF_{t}
PM_{t+1}	**0.592**	**0.363**	**0.199**	**0.150**	**0.189**	-0.057	**-0.165**	-0.047	-0.055	**-0.117**
PM_{t}	—	**0.599**	**0.340**	-0.033	**0.321**	**-0.317**	**-0.306**	-0.022	0.006	**0.113**
$PM_{t\text{-}1}$	—	—	**-0.162**	**-0.104**	**-0.171**	**0.276**	**0.230**	0.018	0.025	-0.009
$\Delta REV_{\text{Growth}}$	—	—	—	**-0.405**	**0.992**	**-0.361**	**-0.778**	**-0.133**	**-0.154**	**0.251**
$\Delta RER_{\text{Price-recovery}}$	—	—	—	—	**-0.385**	**0.396**	**0.316**	0.019	0.016	**-0.119**
$\Delta EXP_{\text{Growth}}$	—	—	—	—	—	**-0.359**	**-0.775**	**-0.144**	**-0.161**	**0.226**
$\Delta EXP_{\text{Price-recovery}}$	—	—	—	—	—	—	**0.162**	0.031	0.037	0.033
$\Delta EXP_{\text{Productivity}}$	—	—	—	—	—	—	—	-0.004	0.021	**-0.312**
Natural log of Total revenues	—	—	—	—	—	—	—	—	**0.979**	**0.284**
Natural log of Total assets	—	—	—	—	—	—	—	—	—	**0.267**

Quarterly profit margin (*PM*) is defined as quarterly operating income in period *t* (adjusted for special items) divided by quarterly sales (*REV*) in period *t*. *LF* (load factor) is defined as RPM_{t} / ASM_{t}. The BDK/HDF measures are defined in the Appendix. **Bold** numbers indicate a Pearson correlation coefficient that differs reliably from zero at $p \leq 0.05$.

Table 5
Descriptive Statistics for Profit Margins for the period of 1996 - 2008

Panel A – Overall Statistics

Quarterly Profit Margin (PM)					
n	Mean	Std. Dev.	Q1	Median	Q3
590	0.0206†	0.1008	-0.0353	0.0314*	0.0917
Quarterly Profit Margin (PM)					
Network (n = 300)	**0.0103**	0.0916	-0.0391	**0.0239***	0.0813
Low-Cost (n = 290)	**0.0311†**	0.1086	-0.0310	**0.0404***	0.1022
Annual Profit Margin (PM)					
n	Mean	Std. Dev.	Q1	Median	Q3
135	0.0262†	0.0817	-0.0171	0.0338*	0.0832
Annual Profit Margin (PM)					
Network (n = 69)	0.0159	0.0724	-0.0325	0.0143	0.0748
Low-Cost (n = 66)	0.0369†	0.0897	-0.0023	0.0410*	0.0944

Panel B – Statistics by Quarter

Quarterly Profit Margin (PM)						
	n	Mean	Std. Dev.	Q1	Median	Q3
Q1	152	-0.0015	0.0901	-0.0519	0.0087	0.0609
Q2	150	0.0622†	0.0777	0.0022	0.0734*	0.1174
Q3	149	0.0373†	0.0928	-0.0153	0.0486*	0.1081
Q4	139	-0.0182	0.1202	-0.0708	0.0049	0.0554

Quarterly (annual) profit margin is defined as quarterly (annual) operating income in period *t* (adjusted for special items) divided by quarterly sales in period *t*. **Bold** numbers indicate a statistically significant difference ($p \leq 0.05$) exists between means (medians) for network carriers and low-cost carriers for the selected metric. † (*) indicates that the reported mean (median) of the measure is significantly different from zero at the $p \leq 0.05$ level.

Table 6
Descriptive Statistics for BDK/HDF Individual Components of Profit Margins for the period of 1996 - 2008

	$\Delta REV_{\text{Growth}}$		$\Delta REV_{\text{Price-recovery}}$		$\Delta EXP_{\text{Growth}}$		$\Delta EXP_{\text{Price-recovery}}$		$\Delta EXP_{\text{Productivity}}$	
Panel A – Overall Quarterly Statistics										
n	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
590	0.0199†	0.0267*	0.0012	0.0035	0.0214†	0.0259*	0.0069†	0.0072*	-0.0043	-0.0032
Panel B – Quarterly Statistics for Network and Low-Cost Carriers										
Network (n = 300)	**0.0066**	**0.0111**	0.0004	0.0046	**0.0080**	**0.0116***	0.0072†	0.0045*	-0.0036	-0.0013
Low-Cost (n = 290)	**0.0308†**	**0.0324***	0.0002	0.0014	**0.0319**†	**0.0315***	0.0055	0.0098*	-0.0043	-0.0046

Table 6 (continued)

Panel D – Overall Annual Statistics

	$\Delta REV_{\text{Growth}}$		$\Delta REV_{\text{Price-recovery}}$		$\Delta EXP_{\text{Growth}}$		$\Delta EXP_{\text{Price-recovery}}$		$\Delta EXP_{\text{Productivity}}$	
n	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
135	0.0950†	0.0636	0.0016	0.0088*	0.0937†	0.0614	0.0145†	0.0219*	-0.0140†	-0.0158*
Panel E – Annual Statistics for Network and Low-Cost Carriers										
Network (n = 69)	**0.0321**†	**0.0377***	0.0025	0.0122	**0.0311**†	**0.0355***	0.0200†	0.0228*	-0.0136†	-0.0175*
Low-Cost (n = 66)	**0.1619**†	**0.1227***	0.0008	0.0061	**0.1602**†	**0.1101***	0.0087	0.0201	-0.0145†	-0.0138*

The BDK/HDF metrics are defined in the Appendix. Each firm-quarter (firm-year) observation is deflated by that quarter's (year's) revenues. Positive (negative) values of the revenue components have the effect of increasing (decreasing) operating income. Positive (negative) values of the expense components have the effect of decreasing (increasing) operating income. **Bold** numbers indicate a statistically significant difference ($p \leq 0.05$) exists between means (medians) for network carriers and low-cost carriers for the selected metric. † (*) indicates that the reported mean (median) of the measure is significantly different from zero at the $p \leq 0.05$ level.

Table 7
Profit Margin Regressions - Pooled Quarterly Sample

Model 1: $PM_{t+1} = \beta_0 + \beta_2 PM_t + \beta_3 PM_{t-3} + \beta_4 PM_{t-4} + \beta_5 LOWCOST + \beta_6 (PM_t \times LOWCOST) + \beta_7 (PM_{t-3} \times LOWCOST) + \beta_8 (PM_{t-4} \times LOWCOST) + \beta_j (Controls) + \varepsilon$

Model 2: $PM_{t+1} = \beta_0 + \beta_1 PM_{t-1} + \beta_2 \Delta REV_{Growth} + \beta_3 \Delta REV_{Price\text{-}recovery} + \beta_4 \Delta EXP_{Growth} + \beta_5 \Delta EXP_{Price\text{-}recovery} + \beta_6 \Delta EXP_{Productivity} + \beta_7 PM_{t-3} + \beta_8 PM_{t-4} + \beta_9 LOWCOST$
$+ \beta_{10} (PM_{t-1} \times LOWCOST) + \beta_{11} (\Delta REV_{Growth} \times LOWCOST) + \beta_{12} (\Delta REV_{Price\text{-}recovery} \times LOWCOST) + \beta_{13} (\Delta EXP_{Growth} \times LOWCOST)$
$+ \beta_{14} (\Delta EXP_{Price\text{-}recovery} \times LOWCOST) + \beta_{15} (\Delta EXP_{Productivity} \times LOWCOST) + \beta_{16} (PM_{t-3} \times LOWCOST) + \beta_{17} (PM_{t-4} \times LOWCOST) + \beta_j (Controls) + \varepsilon$

PANEL A	Quarterly Data (PM_{t+1})		Quarterly Data (PM_{t+2})		Quarterly Data (PM_{t+3})		Quarterly Data (PM_{t+4})	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Intercept	0.1900	0.3039	0.0315	0.2714	-0.3241	-0.2117	-0.3782	-0.2437
PM_t	0.6503***	—	0.2014***	—	0.1489*	—	0.2906***	—
PM_{t-1}	—	0.6189***	—	0.3097***	—	0.4247***	—	0.3014
ΔREV_{Growth}	—	1.2196***	—	1.0444**	—	1.2485***	—	0.9006***
$\Delta REV_{Price\text{-}recovery}$	—	0.9010***	—	0.3162	—	0.1023	—	0.3266***
ΔEXP_{Grpwth}	—	-1.0587***	—	-1.1973***	—	-1.4844***	—	-0.9155**
$\Delta EXP_{Price\text{-}recovery}$	—	-0.9010***	—	-0.2736**	—	-0.1835	—	-0.2625**
$\Delta EXP_{Productivity}$	—	-1.0587***	—	-0.6530***	—	-0.2897	—	-0.4166**
PM_{t-3}	0.3225***	0.3675***	0.2300***	0.1808**	0.0160	-0.0775	-0.1610**	-0.1698**
PM_{t-4}	-0.2798***	-0.2849***	-0.2794***	-0.2270***	-0.1824**	-0.0748	0.0521	0.0410
LOWCOST	-0.0159	-0.0199	0.0404	0.0365	0.1430**	0.1093*	0.1127*	0.0920
$PM_t \times LOWCOST$	-0.2415***	—	-0.0102	—	0.1024	—	-0.0836	—
$PM_{t-1} \times LOWCOST$	—	-0.1373**	—	-0.0182	—	0.0077	—	-0.0275
$\Delta REV_{Growth} \times LOWCOST$	—	-0.1000	—	-0.0551	—	-0.1898	—	-0.3787
$\Delta REV_{Price\text{-}recovery} \times LOWCOST$	—	-0.3170***	—	-0.2522*	—	0.0275	—	-0.0327
$\Delta EXP_{Growth} \times LOWCOST$	—	0.2493	—	0.1495	—	0.2979	—	0.4820
$\Delta EXP_{Price\text{-}recovery} \times LOWCOST$	—	0.5425***	—	0.1544	—	-0.0277	—	0.0665
$\Delta EXP_{Productivity} \times LOWCOST$	—	0.4526**	—	0.1889	—	0.0393	—	0.3004
$PM_{t-3} \times LOWCOST$	-0.1016	-0.1799**	-0.2486***	-0.1884**	0.0019	0.0727	0.0823	0.0922
$PM_{t-4} \times LOWCOST$	0.1564**	0.1630**	0.2197**	0.1605*	0.0560	-0.0659	-0.0802	-0.0720
Natural log of Total Revenues	-0.0110*	-0.0105	-0.0017	-0.0031	0.0229	0.0126	0.0149	0.0094
Market share index	-0.000025	-0.000017	0.000103	0.000042	0.000083	0.000015	0.000099	0.000155
Adjusted R^2	0.5906	0.6042	0.4979	0.5302	0.4449	0.5129	0.5135	0.5183
Model F (*p*-value)	23.36 (0.000)	19.73 (0.000)	16.01 (0.000)	14.52 (0.000)	12.83 (0.000)	13.30 (0.000)	16.60 (0.000)	13.52 (0.000)
N	590	590	576	576	562	562	548	548

The BDK/HDF metrics are defined in the Appendix. Positive (negative) values of ΔREV_{Growth} and $\Delta REV_{Price\text{-}recovery}$ have the effect of increasing (decreasing) operating income. Positive (negative) values of ΔEXP_{Growth}, $\Delta EXP_{Price\text{-}recovery}$, and $\Delta EXP_{Productivity}$ have the effect of decreasing (increasing) operating income. Two-tailed statistical significance at the 0.10, 0.05 and 0.01 levels are denoted by *, **, and ***, respectively. Market share index is defined as the square of the firm's share of the total passengers enplaned during the period.

Table 7 (continued)
Profit Margin Regressions - Pooled Annual Sample

Model 1: $PM_{t+1} = \beta_0 + \beta_1 PM_t + \beta_2\ LOWCOST + \beta_8 (PM_t \times LOWCOST) + \beta_j (Controls) + \varepsilon$

Model 2: $PM_{t+1} = \beta_0 + \beta_1 PM_{t-1} + \beta_2 \Delta REV_{Growth} + \beta_3 \Delta REV_{Price\text{-}recovery} + \beta_4 \Delta EXP_{Growth} + \beta_5 \Delta EXP_{Price\text{-}recovery} + \beta_6 \Delta EXP_{Productivity} + \beta_7 LOWCOST + \beta_8 (PM_{t-1} \times LOWCOST) + \beta_9 (\Delta REV_{Growth} \times LOWCOST) + \beta_{10} (\Delta REV_{Price\text{-}recovery} \times LOWCOST) + \beta_{11} (\Delta EXP_{Growth} \times LOWCOST) + \beta_{12} (\Delta EXP_{Price\text{-}recovery} \times LOWCOST) + \beta_{13} (\Delta EXP_{Productivity} \times LOWCOST) + \beta_j (Controls) + \varepsilon$

PANEL B	Annual Data (PM_{t+1})	
	Model 1	Model 2
Intercept	0.2563	-0.0227
PM_t	0.4409***	—
PM_{t-1}	—	0.6046***
ΔREV_{Growth}	—	-0.7980
$\Delta RER_{Price\text{-}recovery}$	—	0.7926***
ΔEXP_{Growth}	—	0.8457
$\Delta EXP_{Price\text{-}recovery}$	—	-1.0207***
$\Delta EXP_{Productivity}$	—	-1.2627**
LOWCOST	0.0199	0.0270
$PM_t \times LOWCOST$	-0.1339	—
$PM_{t-1} \times$ LOWCOST	—	-0.0751
$\Delta REV_{Growth} \times LOWCOST$	—	0.8472
$\Delta REV_{Price\text{-}recovery} \times LOWCOST$	—	-0.1393
$\Delta EXP_{Growth} \times LOWCOST$	—	-0.8189
$\Delta EXP_{Price\text{-}recovery} \times LOWCOST$	—	0.3439
$\Delta EXP_{Productivity} \times LOWCOST$	—	1.0987**
Natural log of Total Assets	-0.0123	0.0005
Market share index	0.00025*	0.00004
Adjusted R^2	0.3380	0.3792
Model F (*p*-value)	14.68 (0.000)	6.46 (0.000)
N	135	135

The BDK/HDF metrics are defined in the Appendix. Positive (negative) values of ΔREV_{Growth} and $\Delta REV_{Price\text{-}recovery}$ have the effect of increasing (decreasing) operating income. Positive (negative) values of ΔEXP_{Growth}, $\Delta EXP_{Price\text{-}recovery}$, and $\Delta EXP_{Productivity}$ have the effect of decreasing (increasing) operating income. Two-tailed statistical significance at the 0.10, 0.05 and 0.01 levels are denoted by *, **, and ***, respectively. Market share index is defined as the square of the firm's share of the total passengers enplaned during the period. The models include controls for size, market share, capacity utilization, bankruptcy, September 11, year, and firm. The estimated coefficients for size and market share index are included in the table.