Anti-Competitive Effects Of Common Ownership

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Abstract

Many natural competitors are jointly held by a small set of institutional investors. Using the airline industry as a laboratory, we provide evidence that such common ownership has adverse effects on product market competition. We first document that taking common ownership into account implies increases in market concentration that

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are 10 times larger than what is "presumed to be likely to enhance market power" by antitrust authorities. We then identify a positive effect of common ownership on airline ticket prices by exploiting differences across routes in the evolution of common ownership over time. To address reverse causality and other endogeneity concerns, we confirm our results using the exogenous shock to airline ownership concentration generated by BlackRock's acquisition of Barclays Global Investors in 2009. Our results call attention to a hidden social cost – reduced product market competition – that accompanies the private benefits of diversification and good governance.

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1 Introduction

A long theoretical literature in industrial organization recognizes that common ownership of natural competitors by the same investors reduces incentives to compete: the benefits of competing aggressively – gains in market share – come at the expense of firms that are part of the same investors' portfolio (Rotemberg, 1984; Gordon, 1990; Gilo, 2000; O'Brien and Salop, 2000; Gilo, Moshe, and Spiegel, 2006). Theory thus predicts that common ownership pushes product markets toward monopolistic outcomes, implying a deadweight loss for the economy and particularly adverse consequences for consumers. The empirical literature and regulatory practice have focused on the special case of full mergers and acquisitions. By contrast, it is an open empirical question with important policy implications whether smaller levels of common ownership, attained by partial acquisitions of firms by large asset management companies that require no regulatory approval, also decreases competitiveness of the product market in significant ways. This paper provides a first answer to two questions: first, how large are current levels of common ownership? Second, do present-day common ownership levels adverse effects on product market competition?

To approach the first question, note that highly diversified pension funds, mutual funds, and other institutional investors now hold a high (70%-80%) and increasing share of US publicly traded firms, reflecting the benefits they generate for retail investors. Because several asset management companies are also extremely large, in many cases, the same asset management company is the single largest shareholder of several firms in the same industry. Under current antitrust regulation, institutional investors can hold and exercise up to 15% of voting securities of any one company without notifying antitrust authorities. A less appreciated consequence of this rule is that four asset managers can jointly hold 60% of the control rights of all firms in a given industry and induce their portfolio firms to implement the associated anti-competitive incentives without being scrutinized by antitrust authorities. The assumption underlying this rule appears to be that institutional investors that claim to hold the stock "solely for investment" are "passive" owners of the securities and do not affect the behavior of the portfolio firms. Interestingly, however, the largest institutional investors say themselves that a passive investment strategy has nothing to do with their behavior as an owner, and that their passively managed portfolios indeed give them increased incentives to be an active voice in corporate governance. The potential scale of the resulting problem

for product market competitiveness spans across all industries and economies with tradable securities.[1]

For a quantitative evaluation, we focus on the airline industry as a laboratory. The availability of high-quality route-level price and quantity data enables us to more cleanly identify the effect of common ownership on product prices than would be possible in firm-level studies across industries. Treating each route as a market, we first calculate measures of market concentration that take into account the network of cash flow and control rights that constitute the airlines' shareholders' economic interests. Such "modified Herfindahl-Hirschman indexes" (MHHIs) were developed by Bresnahan and Salop (1986) and O'Brien and Salop (2000), and are accepted tools in regulators' assessment of competitive risks imposed by cross-ownership and common ownership by "activist" investors. We use them also for the measurement of anti-competitive incentives of other owners, irrespective of their investment style.

In fixed-effect panel regressions, we find that the anti-competitive incentives implied by common ownership concentration alone – which come on top of those implied by the traditional HHI measure of market concentration and are measured on the same scale – are more than 10 times larger than what the FTC/DOJ 2010 horizontal merger guidelines presume "to be likely to enhance market power." They are also 10 times larger than the HHI-limit beyond which the burden of proof shifts away from the regulator to the involved private parties to show that the implied concentration is not likely to enhance market power. The magnitude of common ownership concentration furthermore dwarfs the time-series variation in HHI. These magnitudes suggest that it would be reasonable to expect an effect of current levels of common ownership on competition.

We next test whether these anti-competitive incentives do indeed translate into measurable effects on product market competition. Specifically, we examine whether changes in com-

[1]Possibly because institutional ownership in 1976 was relatively low and rarely created meaningful common ownership links (Demsetz and Lehn, 1985; Demsetz, 1986), the Hart-Scott-Rodino (HSR) Antitrust Improvements Act of 1976 does not specify limits on holdings of non-voting securities or limits to industry ownership. However, common ownership is pervasive in the present-day US economy. See McCahery, Starks, and Sautner (2014) for an estimate of institutional ownership; see also Rydqvist, Spizman, and Strebulaev (2014). For a case study, see Craig (2013) and *The Economist*, December 7, 2013, according to which BlackRock is the single largest shareholder of one fifth of all American firms. More evidence is provided in section 6 and Appendix Table V. Appendix C shows that institutional "passive" ownership in some firms is already close to 15% indeed: the top 5 shareholders of United Airlines hold 49.5% of the vote shares.

mon ownership concentration over time in a given route are associated with changes in ticket prices. One can think of these fixed-effect panel regressions as an analysis, spanning more than a decade, of the effect on product prices of partial mergers that are quasi-continuously consummated and dissolved among (almost) all players of the industry. At an intuitive level, the hypothesis is that the presence of an independent player that is not owned by the set of investors who own the incumbent airlines makes competition more aggressive. By contrast, competition softens when one airline's owners buy significant ownership and control stakes in a thus-far independent carrier. Appendix A provides a stylized example to illustrate this strategy.

We find that ticket prices are approximately 3-5% higher on the average US airline route than would be the case under separate ownership. As theory predicts, these effects of common ownership concentration alone ("MHHI delta") are of the same magnitude as the effect of the traditional HHI measure of market concentration (for which we control), and are economically large. (The industry's average net profit margin are 1% to 2.4% (IATA, 2014)). We also find that quantity is negatively related to the MHHI delta, indicating that the price effects are not driven by increased demand that institutional shareholders correctly foresee: increased demand would cause higher, not lower, quantity.

To further address this reverse causality and other endogeneity concerns, we next exploit a natural experiment created by BlackRock's acquisition of Barclays Global Investors (BGI) in 2009. Because airline stocks constituted only a small fraction of the merging parties' portfolios, we assume that the event happened for reasons unrelated to route-level differences in US airline ticket prices. This panel-IV strategy uses only variation in common ownership across routes that is implied by the hypothetical combination of the two parties' portfolios as of the quarter before the announcement of the acquisition, and controls for route-fixed effects and local economic conditions. The panel-IV estimates indicate at least 10% higher ticket prices due to common ownership, compared to a world in which firms are separately owned, or in which firms ignored their owners' anti-competitive incentives; the acquisition of BGI by BlackRock alone increased U.S. airline ticket prices (on average, across all routes) by about 0.6%.

These results indicate that current levels of common ownership of firms by diversified institutional investors can indeed raise significant anti-competitive concerns. Moreover, our results illustrate that formal mergers between natural competitors are not the only way lead-

ing to joint asset ownership and elevated levels of effective market power. Shareholders can achieve a similar effect – while avoiding involvement by antitrust authorities – through the creation of common ownership links. If these considerations prove empirically relevant also in other industries, several policy implications arise. First, measures of market concentration that take common ownership into account (such as the MHHI) should be taken into account to assess the competitive risks of proposed mergers and acquisitions, and to assess the competitive risks caused by present-day ownership structures. Second, our results show that consolidation in the asset management industry can adversely affect competition in the product market of their portfolio companies. Therefore, when antitrust authorities evaluate such propositions, the potential benefits need to be weighed against the potential loss of consumer surplus – not just for consumers of asset management products, but also for consumers of the products produced by the merging parties' portfolio firms.

Our results move ownership by large, diversified institutional investors into the focus of the corporate governance debate. For example, it was recently shown that institutional asset managers – previously presumed to be "passive" shareholders – in fact actively and regularly "engage" with their portfolio companies "behind the scenes" (Carleton, Nelson, and Weisbach, 1998; Becht, Bolton, and Röell, 2007; McCahery, Starks, and Sautner, 2014; Dimson, Karakaş, and Li, forthcoming), but less is known about the content of such communications. Investigating these practices may help policy makers understand whether such communication aids the translation of anti-competitive incentives into anti-competitive outcomes, and whether such communication should be scrutinized for compliance with HSR. That said, it is important to recognize that investors need not explicitly communicate their interests to management for the documented outcomes to materialize. All necessary information is public and readily understood by the decision makers of portfolio firms.

A more benign interpretation of our results is that owners generally need to push their firms to aggressively compete, because managers will otherwise enjoy a "quiet life" (Bertrand and Mullainathan, 2003) with little competition and high margins. Only shareholders with undiversified portfolios have an incentive to engage to that effect. Corporate governance research should therefore take shareholders' portfolio holdings into account when assessing the impact of shareholder activism.

At a conceptual level, our analysis suggests that in the presence of powerful diversified shareholders, "good governance" (if narrowly defined as the frictionless implementation of

shareholder interests, see Shleifer and Vishny, 1997) may have large social costs in terms of a loss of product market competitiveness. The benefits of diversification, good governance, and competitive product markets can therefore not be studied in isolation.

The paper proceeds as follows. The next section relates this paper to the existing literature. Section 3 reviews the theory of O'Brien and Salop (2000) and their derivation of the MHHI, and develops the empirical hypotheses. Section 4 describes the data and documents the anti-competitive incentives implied by common ownership, our first key result. Section 5.1 explains the panel regressions and presents their results. Section 5.2 describes the instrumental-variable approach that is based on the BlackRock-BGI acquisition and presents the associated panel-IV results. In section 6, we discuss the potential role of active "engagement" policies by institutional investors in bringing about the documented anti-competitive outcomes of common ownership, and also briefly touch on the related legal debate. Section 7 concludes with a brief discussion of possible approaches to restore competitiveness of the product market.

2 Related Literature

To our knowledge our paper is the first to empirically identify an effect of common ownership on product market prices, and the first to document an effect of a combination of asset management companies on portfolio firms' product prices. Our analysis builds on a large but mostly theoretical literature on the competitive effects of cross-ownership and common ownership. Reynolds and Snapp (1986) extend classic oligopoly models to allow firms to hold shares in competitors. Bresnahan and Salop (1986) introduce the MHHI as a way to quantify the competitive effects of horizontal joint ventures. O'Brien and Salop (2000) develop a more general version of the MHHI that also applies to the case in which shareholders invest in several natural competitors, and which we use in this paper.

Empirically, many papers have studied networks of common ownership generated by diversified institutional investors (see e.g., Faccio and Lang, 2002; Davis, 2008; Vitali, Glattfelder, and Battiston, 2011; Azar, 2012; Davis, 2013), but few have focused on product market outcomes. The closest paper in that respect is Azar (2012), who studies the effect of common ownership on firm-level profit margins. Azar (2012) also introduces the policy "trilemma" between shareholder diversification, shareholder value maximization, and

product market competition. He and Huang (2014) examine the relation between a binary common ownership dummy and firm-level market shares and several corporate finance variables. They find results consistent with increased efficiency due to common ownership, but cannot examine effects on product prices due to data limitations. Our paper is also sharply distinguished from work on corporate equity ownership ("cross-ownership") and its product market consequences (e.g., Allen and Phillips, 2000; Nain and Wang, 2013): we study common ownership of firms by industry outsiders.

The second stream of related literature concerns institutional investors' involvement in corporate governance (e.g., Aggarwal and Samwick, 1999; Hartzell and Starks, 2003; Cronqvist and Fahlenbrach, 2009; Harford, Jenter, and Li, 2011; Kaplan and Minton, 2012; Massa and Žaldokas, 2013; Katz and McIntosh, 2013; Kempf, Manconi, and Spalt, 2013; Schwartz-Ziv and Wermers, 2014). In particular, it is well known that "activist" investors implement changes in executive compensation, turnover, and other corporate decisions, see especially Brav, Jiang, Partnoy, and Thomas (2008); Brav, Jiang, and Kim (2011); Jiang, Li, and Wang (2012). Of course, such measures must sanctioned by the votes of larger, "passive" institutional investors. The key distinction to this literature is that we document product market effects that are driven by a set of investors that is traditionally labelled as "passive," and traditionally thought of as affecting only broad governance questions.

Third, the present paper relates to the empirical literature on the effect of market structure on pricing in the airline industry. Brueckner, Lee, and Singer (2013) provide a comprehensive study of the effect of market characteristics on fares; see also Goolsbee and Syverson (2008) and Dai, Liu, and Serfes (2014). Several earlier papers study the price effect of airline mergers and other route characteristics (Borenstein, 1990; Werden, Joskow, and Johnson, 1991; Kim and Singal, 1993; Borenstein and Rose, 1994, 1995; Peters, 2006; Luo, 2014). Forbes and Lederman (2009, 2010) study the effect of vertical integration in the airline industry on renegotiation costs and operating performance. Our paper differs starkly as our empirical approach holds merger activity and other market characteristics constant and focuses instead on estimating the impact of common ownership on ticket prices. Benmelech and Bergman (2008) study corporate finance questions using the airline industry as a laboratory.

Lastly, our results contribute an empirical answer to the question "Do firm boundaries matter?" (Mullainathan and Scharfstein, 2001). Our results suggest that common ownership links have the effect of blurring formal firm boundaries. A group of firms owned by diversified

shareholders will tend to act as a single entity (see Rotemberg, 1984; Farrell, 1985; Hansen and Lott, 1996; Rubin, 2006, for a theoretical treatment).

3 Theory and Hypotheses Development

3.1 Review of O'Brien and Salop (2000)

O'Brien and Salop (2000) develop a model of oligopoly in which firms maximize a weighted sum of the portfolio profits accruing to their shareholders, where a shareholder's weight in a firm's objective function is proportional to the fraction of the control of the firm held by that shareholder. The model predicts a positive relationship between markups and common ownership concentration. Because we use this measure in our empirical analysis, we provide a brief review of the model, and in particular of the derivation and interpretation of the modified Herfindahl-Hirschman Index (MHHI) in a Cournot setting.

An industry has N firms and M owners. Ownership and control rights may differ, so that a given shareholder may have a higher or lower share of the control of the firm than her ownership share (i.e., cash-flow rights). The ownership share of firm j accruing to investor i is β_{ij}, and the control share of firm j held by owner i is γ_{ij}. Total portfolio profits of investor i are given by $\pi^i = \sum_k \beta_{ik}\pi_k$, where π_k are the profits of portfolio firm k. Firm j implements these incentives by maximizing a weighted average of its shareholders' portfolio profits, where the weights are given by the control weights γ_{ij},

$$\max_{x_j} \tilde{\Pi}_j = \sum_{i=1}^{M} \gamma_{ij} \sum_{k=1}^{N} \beta_{ik}\pi_k, \tag{1}$$

where x_j is the strategy of firm j. To facilitate the interpretation of this formula, we change the order of the sums, take π_k out of the second sum, and divide by $\sum_i \beta_{ij}\gamma_{ij}$ to rewrite the objective function as

$$\max_{x_j} \Pi_j = \pi_j + \sum_{k \neq j} \frac{\sum_i \gamma_{ij}\beta_{ik}}{\sum_i \gamma_{ij}\beta_{ij}} \pi_k. \tag{2}$$

The interpretation of this formula is that firm j maximizes its own profits plus a linear combination of the profits of other firms in which its shareholders hold stakes. The weight

firm j puts on the profits of firm k in its objective function relative to its own profits is given by $\frac{\sum_i \gamma_{ij}\beta_{ik}}{\sum_i \gamma_{ij}\beta_{ij}}$. The latter ratio provides an economically meaningful measure of how connected two firms are in terms of interlocking shareholdings. Note that the weights are asymmetric. The weight firm j gives firm k in its objective function will in general be different from the weight firm k gives firm j. Note also that the price effects predicted below are unilateral and need not be coordinated across firms.

The objective function (2) reflects shareholders' incentives. Under the assumption that firms, by and large, act in their shareholders' interests, it seems a reasonable starting point to predict firm behavior. Whether this maximization problem is of practical relevance in terms of actual firm behavior is the empirical question we address in this paper. Developing alternative models that also incorporate several corporate governance frictions (Dasgupta, Piacentino, and Zhang, 2011) and compensation schemes (Kraus and Rubin, 2010) may be an interesting subject for future research. Similarly, endogenizing vote buying (Dekel, Jackson, and Wolinsky, 2008; Posner and Weyl, 2013) in a context with common ownership is left for future research.

Applying the model to a Cournot setting, the objective function of firm j is given by

$$\max_{x_j} \Pi_j = \sum_{i=1}^{M} \gamma_{ij} \sum_{k=1}^{N} \beta_{ik} \left[P(X)x_k - C_k(x_k) \right], \tag{3}$$

where $P(X)$ is the inverse demand function for the homogeneous good, x_k is the quantity produced by firm k, and $C_k(k)$ are the associated costs.[2] The first-order conditions are

$$\sum_{i=1}^{M} \gamma_{ij} \left\{ \beta_{ij} \left[P(X) - C_j'(x_j) \right] + \sum_{k=1}^{N} \beta_{ik} P'(X) x_k \right\} = 0. \tag{4}$$

This equation represents a weighted average of the first-order conditions for the maximization of the profits of each shareholder, where the weights are the control shares γ_{ij}. Each shareholder balances the benefit of a marginal increase in quantity, $\beta_{ij}\left[P(X) - C_j'(x_j)\right]$, with the cost in terms of reduced prices, $\sum_{k=1}^{N} \beta_{ik} P'(X) x_k$. Note that the expression for the cost implies the shareholders internalize the effect of reduced prices on the profits of all the

[2] Although airlines set prices, one can think of the Cournot model of quantity competition as a reasonable way to model the strategic interaction of firms in airline markets, given that airlines need to make capacity commitments. Kreps and Scheinkman (1983) show that price competition with quantity pre-commitment yields a Cournot outcome. Several authors have since derived similar results under milder assumptions.

firms in their portfolios, see also Hansen and Lott (1996).

It can be shown by algebraic manipulation of the first-order conditions that in equilibrium the market share-weighted average markup in the industry is given by

$$\sum_j s_j \frac{P - C_j'(x_j)}{P} = \frac{1}{\eta}\left[\sum_j \sum_k s_j s_k \frac{\sum_i \gamma_{ij}\beta_{ik}}{\sum_i \gamma_{ij}\beta_{ij}}\right], \tag{5}$$

where η is the price elasticity of demand and s_j is the market share of firm j. We thus see that in a classic Cournot setting, with separately owned firms, the market share-weighted average markup is proportional to the Herfindahl-Hirschman Index (HHI), equal to $\sum_j s_j^2$. This provides a theoretical justification for the use of the HHI as a measure of market power in a setting without common ownership. Under more general ownership structures, O'Brien and Salop (2000) propose using the MHHI, defined as

$$MHHI = \sum_j \sum_k s_j s_k \frac{\sum_i \gamma_{ij}\beta_{ik}}{\sum_i \gamma_{ij}\beta_{ij}}, \tag{6}$$

as a measure of market power. By simple algebra, MHHI can then be rewritten as

$$MHHI = HHI + \sum_{k \neq j} s_j s_k \frac{\sum_i \gamma_{ij}\beta_{ik}}{\sum_i \gamma_{ij}\beta_{ij}}. \tag{7}$$

The second term in the last expression is the difference between the MHHI and the HHI, referred to as the MHHI delta. The MHHI delta is a measure of the anticompetitive incentives due to common ownership. For example, consider two firms that have 50% market share each. The HHI is 5,000 on a scale of 0 (perfect competition) to 10,000 (monopoly). If the firms are separately owned, the MHHI delta is 0 and the MHHI equals the HHI, 5,000. If the two owners swap 50% of their shares and thus jointly are a monopolist, the HHI is still 5,000, but the effective market concentration, reflected by a MHHI of 10,000, is identical to that of a monopoly. Thus, the MHHI reflects the economically meaningful market concentration. The online appendix provides further examples of MHHI calculations to aid with intuition.

3.2 Discussion

On a first look, it might appear that the computational complexity of the implementation of these incentives is rather high in our setting. However, while the predicted variation in

prices is at the route-level, the agent setting product market strategy only needs to keep track of firm-pair level variation in common ownership to determine the optimal level of competition in every route. That is, rather than keeping thousands of different degrees of optimal competitive aggressiveness in mind, the pricing manager only needs to assess how aggressive her shareholders would want to compete with a small set of competitors. This information is easily inferred from the own and competitor firm's top owners, which is public information, and moreover frequently communicated in engagement meetings. Our interviews with pricing managers indicate that they are well aware of their competitors' owners, which informs route-level pricing strategies. In sum, the computational complexity of implementing the shareholders' objective is not substantially different than in the setting of existing studies.

Note also that it is well known that pricing occurs at the route level, at high frequencies, and with substantial human involvement, as opposed to being executed by a standardized computer program. Pricing is one of the core competencies of airlines.

3.3 Hypotheses Development

The question this paper attempts to answer is whether common ownership concentration has additional explanatory power for product prices, over and above the impact of market concentration that ignores common ownership links generated by large institutional investors. We use the MHHI delta to measure common ownership concentration, and the classic HHI to measure market concentration without common ownership. If anti-competitive shareholder incentives matter for portfolio firms' product market strategy, we should see a price impact of the MHHI delta, both at the market-carrier and at the market level (assuming a homogenous good in every market). If, on the other hand, corporate governance or informational frictions, or the fear of an antitrust backlash entirely prevent shareholders from implementing a mechanism that reflects these incentives, we should see no price impact. This consideration informs the null hypothesis:

H0: Common ownership by diversified institutions, as measured by the MHHI delta, has no effect on market-carrier-level and market-level ticket prices.

If, on the other hand, economic incentives matter for economic outcomes at least to some extent, the alternative interpretation should find support in the data.

H1: Common ownership by diversified institutions, as measured by the MHHI delta, has

a positive effect on market-carrier-level and market-level ticket prices.

4 Data

4.1 Data Sources

4.1.1 Airline Pricing and Market Shares

Following the literature, the markets we consider are origin-destination airport pairs in the United States, regardless of direction. We construct fares and passenger shares for each market using the publicly available Department of Transportation's Airline Origin and Destination Survey (DB1B) database, which contains a quarterly 10% sample of airline tickets for the period 2001Q1-2013Q1.

The DB1B database includes the origin, destination, and price paid for a ticket, as well as how many passengers traveled on that ticket. In addition, it contains the operating and marketing carrier for each separate coupon of a ticket. To construct prices and the number of passengers at the carrier level, we assign a ticket to the marketing carrier (rather than the operating carrier), and we exclude tickets with multiple ticketing carriers from the analysis.[3] We limit our analysis on markets with an average of at least 20 passengers a day. We retain over 1 million observations at the carrier-market-quarter level. We also apply a number of other filters to screen out tickets that cannot readily be assigned to a particular market, or that contain unreliable information, as described in detail in the online appendix.

Table I shows the summary statistics for our sample, both at the carrier-market and at the market level. The average 2008-CPI-adjusted fare per passenger across markets is $217. Average quarterly passengers are about 3,720 per carrier and market and about 18,323 per market. The HHIs are calculated based on passenger shares of ticketing carriers, and average about 5,200 across markets. On average, around two thirds of passengers in a given market use connecting flights.

[3]We thus abstract away from frictions associated with imperfect vertical integration (Forbes and Lederman, 2009, 2010), which is of lesser concern to our setting compared to the importance of painting a realistic picture of competition between any two airport pairs. Relatedly, note that alliances, over and above direct affiliations, are typically between domestic and foreign carriers but not between domestic carriers (Brueckner and Whalen, 2000). In rare exceptions, such as the codeshare agreement between US Airways and United Airlines, we ensure in an untabulated robustness check that combining the market shares of both companies as if they were a single entity does not significantly affect the results.

We ensure robustness to a number of additional control variables that capture market characteristics not captured by the HHI measure of market concentration. We use the T100 data published by the US Department of Transportation to construct the number of nonstop carriers serving the market, and whether Southwest or other low-cost carriers (LCCs) are serving the market nonstop. On average, our sample markets contain 0.8 nonstop carriers. Southwest is competing nonstop in 9% of the markets, and other LCCs are competing nonstop in 8% of the markets. We also map the airport-pairs that define each market to metropolitan areas and compute population and per capita personal income for these metro areas from the Bureau of Economic Analysis as controls. For each market in our sample, we calculate the geometric mean across the metro areas at the endpoints to capture the population and income per capita in the market, following the airline literature (see, e.g., Brueckner, Lee, and Singer (2013)). The average "market population" is 2.3 million and the average "market income" is about $41,000. The fraction of institutional ownership in the airline industry is similar to that reported in other studies, e.g., Rydqvist, Spizman, and Strebulaev (2014). Note that we report cash flow rights, not control rights. As a result, institutional ownership can exceed 100% in a few cases because of the presence of preferred (non-voting) shares.

4.1.2 Data on Airline Ownership

To construct the common ownership network for the airline industry, we start with institutional holdings from the Thomson-Reuters Spectrum dataset on 13F filings. This data set includes investments in all US publicly traded stocks by institutional investors managing more than $100 million. The Thomson-Reuters data identify institutional investors by SEC filing, assigning them a manager number.[4] It includes information on the fraction of the shares that are voting shares. We restrict the data to holdings of at least 0.5% (adding voting and non-voting shares) of shares outstanding. Holdings are not observed during bankruptcy periods. During the bankruptcies of American Airlines, Delta Airlines, Northwest Airlines,

[4]The largest asset management companies accumulate votes at the aggregate level, similar to voting trusts as described by Becht, Bolton, and Röell (2007). Davis and Kim (2007) provide evidence of proxy voting by mutual funds at the family level. Funds with higher costs and lower benefits of implementing own corporate governance initiatives are more likely to vote with ISS recommendations (Iliev and Lowry, 2012). Note that coordinating corporate governance activities at the family level can be consistent with fulfilling the asset manager's fiduciary duty toward all of the the fund family's investors individually: the equilibrium outcome can benefit all investors, even if each individual owner would choose a slightly different policy. The asset manager merely serves as a coordinating device.

United Airlines, and US Airways, we repeat the last observed value for percentage of shares owned. Because pricing may differ during bankruptcy (Borenstein and Rose, 1995), we also estimate specifications excluding bankruptcy periods. The results are qualitatively similar, and we include them in the appendix. Note also that Phillips and Sertsios (2013) don't find statistically significant price effects from bankruptcy.

We also use data on non-institutional ownership that we hand-collect from SEC Proxy statements, available from the SEC website, if they hold 5% or more of outstanding shares in any company in our sample. Although rare cases of significant ownership stakes by non-institutional investors exist, they are restricted to a single firm and therefore do not induce common ownership links.

Following Hartzell and Starks (2003), for use as controls, we also calculate the share of institutional ownership, institutional ownership concentration (measured as the HHI of the institutional ownership shares), and the fraction of total institutional ownership that is owned by the top five institutional owners in the firm. For the market-level regressions, we calculate a passenger-weighted average of the institutional ownership variables. As the summary statistics show, in the average route, institutional investors hold 77% of the shares of the carriers in the route, similar to the average institutional ownership of firms outside the airline industry as reported by McCahery, Starks, and Sautner (2014). The top five institutional investors hold around 44% of the total institutional holdings, reflected by an average institutional ownership concentration in the average route of 678 HHI points.

To give a sense of who these investors are, the size of their ownership stakes, and the extent to which their ownership interests overlap, we provide the top 10 shareholders and their ownership percentage as of the first quarter of 2013 for a sample of airlines in Appendix Table VI. Note that the top 5 shareholders of United Airlines - the third-largest airline – alone hold 49.5% of ownership rights. Out of the largest seven shareholders of United Airlines, who hold 60% of the vote share, five are also among the largest 10 shareholders of Southwest and Delta Air Lines, the largest and second-largest carrier, respectively. We use the differences in the size of different investors' ownership stakes across airlines and time and from variation of market shares of these airlines across routes and time for our identification.

4.2 Networks of Common Ownership

The data on market share, as well as ownership and control rights the institutional investors hold in each airline, enable us to reconstruct the network of interlocking shareholdings that characterizes each market we analyze. Specifically, we calculate the control share for shareholder i in firm j, γ_{ij}, as the percentage of the sole voting shares of firm j held by institution i.[5] We calculate the ownership share of shareholder i in firm j, β_{ij}, as the percentage of all shares (voting and non-voting) of firm j held by institution i. We exclude shareholdings with voting and non-voting shares of less than 0.5% of outstanding. Doing so amounts to assuming that institutions with less than 0.5% have no weight in the objective function of the firm. An untabulated robustness check shows this filter does not affect the results. The online appendix contains a more detailed description and an illustration of the resulting ownership network.

4.3 Quantifying Economic Incentives Using the MHHI

We calculate the MHHI for each route for each quarter between 2001Q1 and 2013Q1. Figure 1 shows the average MHHI and average HHI across routes over time for that period. The differences between the MHHI and the HHI, called MHHI delta, are a measure of the market concentration that is generated by common ownership alone. The average MHHI delta was around 2,000 at the beginning of the period, declined to around 1,000 in 2006-2007

[5] According to our interviews with industry insiders, and as further substantiated by asset managers' public statements reflected in section 6, although the formal authority to vote proxies rests with fund managers, in practice, fund managers of the largest mutual fund companies almost always follow the recommendation of the fund family's corporate governance and proxy office. Index funds in particular usually outsource all decision making with respect to voting, thus making their proxies available to the active side of the fund family. We also hand-checked proxy voting guidelines of most large fund management companies and in almost all cases found statements indicating that corporate governance is implemented centrally on behalf of all active and passive funds of the family. We therefore calculate the MHHIs using fund family holdings rather than individual funds' holdings. Whether MHHIs based on fund-level holdings would be smaller or larger than MHHIs based on family-level holdings is not clear ex ante; it depends on the relative degree of diversification of smaller versus larger funds within the family. If less diversified shareholders are split into many specialized funds, whereas diversified shareholders have only a few funds (or vote at the family level), MHHIs calculated at the fund level are larger, and the MHHI delta we present in this paper is an underestimate. We do not consider the possibility of smaller block holders forming coalitions as suggested by Zwiebel (1995), because we have no hard data that suggests such block formation in our setting. Interviews with asset managers indicate that antitrust concerns prevent them from discussing proxy voting with other investors at a high frequency.

when several diversified shareholders reduced their exposure to the industry amid its low profitability, and then increased again to more than 2,000 in 2013. The variation over time is driven both by changes in (firm-pair level) common ownership and by (route-firm-pair level) changes in market shares. For example, the decrease before 2009 can be generated by well-diversified investors selling shares (maybe mechanically because they follow a passive investment strategy and airline market values dropped), and getting replaced by investors that focus on one particular airline company. The stark increase in MHHI delta in 2009 coincides with BlackRock's acquisition of Barclays Global Investors.

According to the DOJ/FTC 2010 Horizontal Merger Guidelines, in highly concentrated markets (i.e., markets with an HHI greater than 2,500), mergers involving changes in the HHI of more than 200 points are "presumed likely to enhance market power." Thus, the average MHHI delta in the airline industry generated by common ownership by institutional investors in 2013Q1 was more than 10 times higher than the threshold that would likely generate antitrust concerns according to the guidelines. This threshold also marks the point beyond which, if two parties were intending to merge, the burden of proof that the merger does not lead to enhanced market power is on the merging parties (as opposed to the regulator). If one were to consequentially apply this logic also to changes of market concentration that are due to common ownership, asset managers would have to prove that the common ownership links that they generate do not affect market prices.

Figure 2 shows histograms of the distribution of MHHI deltas across routes in 2001Q1 and in 2013Q1. These distributions reflect the cross-sectional variation in common ownership links across routes that we use in our identification. Many routes have a MHHI delta of zero – the is no common ownership. That is the case either if only one carrier serves the route, or if the route is served by two carriers, one of which is a private company, whose shares are not owned by the same institutional investors that own the publicly traded carriers. For example, JetBlue was not publicly traded in 2001, went public in 2002, and became owned by similar investors as legacy carriers thereafter. Such changes of ownership are part of the route-level variation in MHHI delta we use. On the other end of the spectrum, the highest MHHI deltas are over 5,000 HHI points, meaning common ownership alone adds an amount to market concentration equivalent to reducing the number of firms competing in a market from two equal-sized ones (HHI=5,000) to one (HHI=10,000), creating a monopoly.

In sum, the incentives for anti-competitive behavior implied by current levels of common

ownership, as measured by the MHHI delta, are an order of magnitude larger than the implications for market power recognized by conventional measures that are measured on the same scale. Whether firms implement these incentives is the empirical question we address in the following sections.

5 Empirical Methodology and Results

Having documented that MHHI deltas are very large, we now know that common ownership links across airlines create significant anticompetitive incentives. In this section, we investigate whether firms set prices consistent with these incentives. Figure 3 plots the average airfare against the average MHHI delta for each market in our sample, where the average is taken across all quarters in our sample period. A linear fit indicates a positive raw correlation between airfares and MHHI delta across markets. Of course, we do not infer a causal effect from that raw correlation. Many factors could impact the level of airfares across markets that may also be correlated with common ownership in a given market. We attempt to provide clean evidence by using variation of airfares and the MHHI delta in the same market over time, while controlling for other changes, as the following section explains.

5.1 Panel Regressions of Product Prices and Quantities on Common Ownership

5.1.1 Panel Regression Methodology

In our main specification, we regress the logarithm of average price for carrier j in route i at time t on the MHHI delta, the HHI, additional controls, time-fixed effects, and market-carrier fixed effects:

$$\log\left(p_{ijt}\right) = \beta \cdot \text{MHHI delta}_{it} + \gamma \cdot HHI_{it} + \theta \cdot X_{ijt} + \alpha_t + \nu_{ij} + \varepsilon_{ijt}, \tag{8}$$

where p_{ijt} is the average price for carrier j in route i at time t, MHHI delta_{it} is the MHHI delta in route i at time t (it is the difference between MHHI and HHI – *not* the time variation in MHHI), X_{ijt} is a vector of controls, α_t are time fixed effects, and ν_{ij} are market-times-carrier fixed effects.

Additionally, we run regressions aggregated at the market level:

$$\log(p_{it}) = \beta \cdot \text{MHHI delta}_{it} + \gamma \cdot HHI_{it} + \theta \cdot X_{it} + \alpha_t + \nu_i + \varepsilon_{it}, \tag{9}$$

where p_{it} is the average price in route i at time t. Following Goolsbee and Syverson (2008), we weight the market-carrier-level regressions by average passengers for the market and carrier over time and cluster standard errors at the market level. For the market-level regressions, we weight by average passengers in the market over time and cluster standard errors at the market level as well.[6] As controls, we include various market characteristics that the HHI does not capture: the number of non-stop carriers operating in a route, an indicator for whether Southwest operates non-stop in a route, an indicator for whether another low-cost carrier (LCC) operates in a route, geometric average of the population in the two endpoints of a route, the geometric average of per capita income in the two endpoints in a route, the share of passengers in the market that travel using connecting flights, and the share of passengers for the market carrier that travel using connecting flights (in the market-carrier-level regressions).

In addition, we control for variables that capture the effect (if any) on airline ticket pricing of institutional ownership per se. Following Hartzell and Starks (2003), we include the share of institutional ownership, institutional ownership concentration (measured as the HHI of the institutional ownership shares), and the fraction of total institutional ownership that is owned by the top five institutional owners in the firm. For the market-level regressions, we calculate a passenger-weighted average of the institutional ownership variables.[7]

5.1.2 Panel Regression Results

Results from our basic specifications are reported in Table II. The first specification reports results from a regression of log average fare by carrier market on the MHHI delta, HHI,

[6] Whereas we stick to this literature standard in the reported result, we do ensure that the results are robust to two-way clustering (untabulated).

[7] While throughout the paper the HHI and MHHI are expressed on a scale of 0 to 10,000, we use a scale of 0 to 1 for the regressions to make the coefficients more readable. The HHIs are potentially endogenous. However, Gayle and Wu (2012) show that simultaneity bias is negligible, and therefore the literature in general does not instrument (Morrison, 2001; Gayle and Wu, 2012; Brueckner, Lee, and Singer, 2013). In unreported robustness tests, we nevertheless check if the assumption that HHIs are exogenous affects our results. We find that the coefficient on common ownership is slightly higher when we instrument HHI with lagged HHI.

market-carrier fixed effects, and year-quarter fixed effects. We find a large and significant positive effect of MHHI delta on average fares across all specifications. The coefficient of 0.201 in the first specification implies that an increase in the MHHI delta from 0 to 2,200 (current levels of MHHI delta) would be associated with an increase in average fares of 4.9%. The effect of HHI is almost identical, as predicted by the model. (Regressing prices on MHHI (rather than MHHI delta and HHI separately) produces coefficients around 0.21.)

In the next specification, we control for additional market characteristics: the number of nonstop carriers, a Southwest nonstop presence indicator, and other LCC nonstop presence indicators, average population of the endpoints, average income per capita of the endpoints, average share of passengers traveling using connecting flights in the market, and average share of passengers traveling using connecting flights for a given carrier in a given market. The coefficients of both the HHI and the MHHI delta are lower than in the specification without controls, but are still positive and statistically and economically significant. The coefficients on the control variables have the expected signs: a larger number of nonstop competitors, Southwest's and other LCC's nonstop presence, and a larger end-point population are all associated with lower fares. In the third specification, we add institutional ownership and institutional ownership concentration controls. The coefficients of both the HHI and the MHHI delta are essentially unchanged. A higher fraction of institutional ownership is associated with lower average fares. A higher level of institutional ownership concentration (measured using either the institutional ownership Herfindahl or the fraction of institutional holdings held by the top five institutions) is associated with higher average fares.

Notice that the effect is identified not at the firm level, but across markets, whereas a single firm operates in many different markets. Therefore, an improvement in firm-level monitoring due to common ownership by diversified institutional investors (Edmans, Levit, and Reilly, 2014) or internal capital markets (Stein, 1997) cannot explain the results. More generally, because the time variation to be explained is at the route level, a firm-level omitted variable cannot drive our results. Relatedly, because we employ route-fixed effects, market power on specific routes exerted through frequent-flyer programs (Lederman, 2007) is differenced out in our regressions.

Specifications 4 to 6 are analogous to specifications 1 to 3, but aggregated at the market level instead of at the market-carrier level. We find qualitatively similar results, but the coefficients of both the MHHI delta and the HHI are higher. One possible reason is that

specifications 4 to 6 does not control for market-carrier-specific factors, which may affect prices in the entire market. For example, whether a route is between two hubs of a given carrier would not be controlled for. Another possibility is that the higher number of fixed effects in the market-carrier-level regressions exacerbate measurement error and therefore lead to more severe attenuation bias.

We investigate whether the effect of the MHHI delta is similar over time, by interacting both the MHHI delta and the HHI with year dummies. Figure 4 shows the results for a specification at the market level with weights and all additional controls. The effect of MHHI delta on fares is positive and statistically significant in most years. The effect of the HHI on fares is very similar in magnitude in almost all years. One reason why the MHHI delta effect is insignificant in 2006 and 2007 may be that both Delta Air Lines and Northwest were bankrupt during all of 2006 and some of 2007. These bankruptcies may confound the effect of MHHI delta, not only because an airline may compete differently during bankruptcy, but also because shareholders have no de jure control rights during these times. It seems plausible that firms do not primarily focus on the maximization of diversified shareholders' interests by putting weight on other firms' profits in such periods.

In sum, the results indicate that common ownership concentration, measured as MHHI delta, has a statistically significant and economically sizable effect on airline ticket prices. The effect is of a similar economic magnitude as the effect of the traditional HHI measure of market concentration, except during times when shareholders do not have control rights.

5.2 The Effect of a Combination of Asset Managers on Product Prices of Portfolio Firms (Panel-IV)

To address reverse causality and other endogeneity concerns, we exploit a change in route-level MHHIs that was caused by an event that arguably happened for reasons orthogonal to developments in route-level pricing strategy within the US airline industry, and therefore can be used to construct a panel-IV design. We first outline why BlackRock's acquisition of Barclays Global Investors constitutes such an event, before we explain the methodology in more detail.

5.2.1 BlackRock's Acquisition of Barclays Global Investors

Following the financial crisis that began in 2007, Barclays tried for several months to strengthen its balance sheet. On March 16, 2009, Barclays made public that it had received a $4 billion bid by CVC Capital Partners for its iShares family of exchange-traded funds. The CVC offer contained a go-shop clause, however, that enabled Barclays to solicit competing offers. A bid by BlackRock to acquire not only iShares, but all of iShares' parent division Barclays Global Investors (BGI), for $13.5 billion was announced on June 11, 2009. The bid was successful and the acquisition was formally completed in December 2009, creating the largest asset management company globally.

The long history of Barclays' attempt to sell iShares to investors other than BlackRock suggests the divestment decision was not primarily driven by considerations regarding how the iShares portfolio would combine with BlackRock's in terms of potential product market effects. Moreover, US airline stocks of course comprised only a small share of BGI's portfolio, which makes it unlikely that they were pivotal in BlackRock's decision to acquire BGI. As a result, the BGI acquisition provides a presumably exogenous source of variation in common ownership across airline routes.

While airlines made up only a small part of the merging parties' portfolios, both Barclays and BlackRock were among the largest owners in several airlines. Because their percentage ownership were not identical across airlines, however, the acquisition affected common ownership in some routes more than others. These considerations are at the core of our panel-IV methodology, which we describe in detail in what follows.

5.2.2 Panel-IV Methodology

As explained above, the acquisition of Barclays BGI generated variation across routes in the implied change in common ownership. We exploit this variation to identify the effect of common ownership on airline prices as follows. We start by calculating the MHHI delta in the quarter before the acquisition was announced, 2009Q1, for each airline market. We then calculate a counterfactual MHHI delta for the same period with the only difference being that we treat the holdings of BlackRock and Barclays as if they had been held by a single entity already. We call the difference between the latter MHHI delta and the former MHHI delta the "implied change in the MHHI delta." We construct an panel-IV strategy based on

this implied change in MHHI delta.

Between the pre- and post-period, many changes can occur in portfolios and market shares, some of which might be endogenous, and the sum of which results in the actual change in the MHHI delta. The BGI acquisition is only one of these changes. If it were the only change, the actual change in the MHHI delta would be exactly the same as the implied change. If the other changes are small relative to the BGI acquisition, it will not be exactly the same, but the correlation between the two will be high, resulting in a strong instrument. We show below that the implied change in the MHHI delta is in fact a strong predictor of the actual changes in the MHHI delta. Thus, we can think of the implied change in the MHHI delta as a "treatment" variable, which measures a given route's level of exposure to the acquisition event. As the pre-period, we use the first quarter before the announcement, 2009Q1. Because the merger is consummated only in December 2009, we use 2011Q1, 2012Q1, and 2013Q1 as the post-periods (we use the same quarter as the pre-period to rule out effects of seasonality). Notice that neither a hypothetical merger of two equity portfolios nor any other transfer of ownership affects market shares, and thus the traditional HHI measure of market concentration. The introductory example presented in appendix A attempts to clarify this point.

In a discrete-treatment version, we divide markets into terciles according to their implied changes in their MHHI deltas, and assign markets in the top tercile to the treatment group, and markets in the bottom tercile to the control group. In a continuous-treatment version, we use the implied change in MHHI delta as a continuous treatment variable. The relative benefit of the discrete-treatment specification is that it might mitigate concerns related to measurement error, whereas the benefit of the continuous-treatment version is that it makes use of more variation. We use the treatment status interacted with a post-period indicator as an instrument for the actual MHHI delta. The instrument is equal to zero in the pre-period for all markets. In the discrete-treatment version, the instrument is equal to one in the post-period if the market is in the treatment group, and equal to zero in the post-period if the market is in the control group. In the continuous-treatment version, the instrument is equal to the value of the continuous treatment variable in the post-period.[8]

[8]Note that because we include route-carrier fixed effects, our specification is equivalent to specification in differences, instrumenting the actual change in the MHHI delta between the pre- and post-periods with the implied change in the MHHI delta (i.e., without interacting the treatment variable with a post-period dummy). We checked that running the specification in differences indeed yields the same numerical results

Figure 5 shows the distribution of the implied change of MHHI delta across routes. The mean and median across routes of the implied change is 91 HHI points; the implied change is larger than 100 HHI points in more than 2,000 routes; the largest implied increase is 281 HHI points. These are non-trivial changes in market concentration, for which we can reasonably expect to find increases in market prices: the DOJ/FTC Horizontal Merger Guidelines. They state that "Mergers resulting in highly concentrated markets [HHI over 2,500] that involve an increase in the HHI of between 100 points and 200 points potentially raise significant competitive concerns and often warrant scrutiny." Thus, regulators would likely scrutinize the merger of two airlines with the same effect on market concentration, but they do not currently scrutinize the effect on concentration of portfolio industries induced by the merger of two asset management firms, as long as the latter are labeled as "passive" investors.

Several significant events occurred in the airline industry during the time period around the BlackRock-BGI acquisition. Although none of them is likely to have caused the acquisition, we nevertheless examine their effect on our estimates. First, the Delta and Northwest merger was announced in April 2008 and became effective in September 2008. Second, the United and Continental merger was announced in May 2010 and became effective in October 2010. The mergers potentially directly affected markets that had a sizable share of both merging partners. We thus control for the merging parties' shares in the quarter before the merger. In addition, American Airlines filed for bankruptcy in November 2011. Markets that had a positive share of American Airlines in any quarter between 2009Q1 and 2013Q1 were potentially directly affected by the American Airlines bankruptcy, and we thus control for American's maximum share in a market between 2009 and 2013. In addition, the US economy was emerging from recession around the time of the BGI acquisition. (The recession officially ended in June 2009 according to the NBER.) We control for the potentially different effect of macroeconomic conditions across routes by including the (geometric) average income per capita and of population of the two endpoints of the route.

5.2.3 Panel-IV Results

Figure 6 shows the time series of average ticket prices in the treatment and control markets, respectively. The graph clearly shows that ticket prices in the treatment and control markets co-move very closely with each other until the post-merger integration of BGI is

as corresponding the fixed-effects specifications (in the regressions with only one post-period).

completed. That is to say, the parallel-trends assumption is satisfied. After the integration is completed, prices in "treated" markets increase relative to the prices of "control" markets, indicating a positive effect of the implied increase in common ownership on ticket prices. We now turn to a quantitative analysis of this effect.

Table III first presents the first-stage regressions of MHHI delta on the instrument ("Treat × Post") and several control variables. The first four columns use the discrete "treatment" versus "control" specification; columns (5) to (8) contain the results using all information from the distribution of MHHI deltas, that is, the continuous treatment specification. The first three columns of each set of results use MHHI delta at a particular point of time as the outcome variable; the fourth column averages across these three periods. The results reject the concern of a weak instrument. Specifically, the within-R-squared (not taking into account the explanatory power of fixed effects.) is higher than 53% in all cases.

Table III (continued) reports the second-stage results of the panel-IV estimation, using treatment times post-period as an instrument (i.e., the instrumented MHHI delta) for the actual MHHI delta in panel regressions. Specifications 1 to 4 report results using the discrete-treatment variable, and specifications 5 to 8 report results using the continuous-treatment variable. In the second stage discrete treatment version, we find, consistent with the price plot, no effect of MHHI delta on airfares in 2011Q1, but positive and significant coefficients in 2012Q1, 2013Q1, and for all three periods combined. The estimated effect of the MHHI delta on average fares for the post-periods 2012Q1 and 2013Q1 is around 0.5 for the years after 2012Q1 and thus markedly higher than for the panel regressions reported previously. Multiplying the estimate with the average MHHI delta across routes indicates that ticket prices are at least 10% higher because of common ownership alone, compared to a counterfactual world in which firms are separately owned, or in which firms ignore the anti-competitive incentives of their shareholders. Of course, separate ownership is unrealistic in a world with 80% institutional ownership and an extremely skewed size distribution of asset managers. Given that the average implied MHHI delta is about 91 HHI points, our estimates indicate that ticket prices on the average airline route in the U.S. increased by about 0.6% as a direct result of the BlackRock-BGI acquisition.

The results using the continuous treatment are of a similar magnitude as the results using the discrete treatment. The likely reason the price effect becomes measurable with one year's delay is that a post-merger integration of two companies takes a considerable amount

of time. In the words of Laurence D. Fink, Chairman and CEO of BlackRock (on April 26, 2010, about the integration of the BGI iShares platform in response to an analyst question), "mergers are tough and they take time to bring the overall firm together as one."(Dealbook, 2010) The delay in the price response to an increase in common ownership is similar to the time it takes for increased market concentration implied by full mergers to affect prices (e.g., Borenstein, 1990; Ashenfelter, Hosken, and Weinberg, 2013; Luo, 2014).

The fact that common ownership below HSR thresholds is currently unregulated is indeed important for the interpretation of these results. Our estimates for the effect of common ownership are comparable to the highest estimates from studies of full airline mergers. For example, Kim and Singal (1993) find that airline mergers during the less tightly regulated period 1985-1988 (all approved by the Department of Transportation) increased airfares in affected routes by 9.4% compared to routes that were unaffected by the merger. Studies of airline mergers in other periods (regulated by the DOJ/FTC) find only small price increases; see, e.g., Borenstein (1990); Luo (2014). It is not surprising that unregulated increases in common ownership, as implemented by an acquisition in the asset management industry and measured in the present paper, have stronger effects on product prices than mergers that have been scrutinized by antitrust authorities.

For robustness, we show OLS results using the same sample as in the IV regressions in Table IV. This analysis can be informally viewed as a "non-instrumented" execution of the event study. The OLS estimates of the effect of the MHHI delta on fares are positive and significant in all specifications. The coefficient on MHHI delta is higher than in the IV results for 2011Q1, but lower in 2012Q1, 2013Q1, and in the specification including all three post-periods. In sum, qualitatively similar results obtain in the non-instrumented version of the event study. The fact that we find a positive an statistically significant coefficient already for prices measured in 2011Q1 in this analysis is due to the difference between actual changes in MHHI delta and implied changes. The previous analysis of the BlackRock-BGI acquisition used only information that was available before the announcement of the acquisition to compute implied changes in market concentration. The analysis presented here uses the actual changes of ownership concentration that occurred in the history of this industry, which may or may not be related to the BlackRock-BGI acquisition.

5.3 Robustness Checks

This section discusses various robustness checks of the main results, focusing on the panel regressions which have greater scope. As discussed previously, carrier-level, route-level, and firm-route-level explanations for our findings are mechanically differenced out with fixed effects in the various panel regressions. We addressed reverse causality concerns with the panel-IV, but wish to provide additional test of the reverse causality hypothesis. To illustrate one variation of the hypothesis, suppose that institutional investors correctly predict demand in particular routes, and buy shares of airlines with high market shares in those routes.[9] A decrease in quantity would speak against that explanation. The first test investigates whether the price increases due to common ownership are accompanied by reductions in market-level demand, as predicted by theory.[10] Table VII shows results for the regressions of passenger volume on common ownership. The first specification includes as controls only HHI, MHHI delta, year-quarter fixed effects, and market fixed effects. The second specification adds additional market structure controls, and the third specification includes all the controls used in the price regressions. In all specifications, both the HHI and the MHHI delta have a negative and significant effect on market passengers, although the magnitude of the coefficients is less stable across specifications. The coefficient on the HHI ranges from -0.486 to -0.657, whereas the coefficient on MHHI delta is -0.633 in the specification without controls, and -0.269 in the most saturated specification. While the literature is primarily concerned with price effects, this robustness test on quantity indicates that increasing demand and reverse causality are not the driver of the price effects.

We next provide several robustness tests for the fixed-effects panel regressions results.

[9] Another variation of the reverse causality argument is that pre-merger talks might soften airline competition; institutions might know of these talks and accumulate shares, and a positive correlation between prices and MHHI delta might occur.

[10] According to theory, an increase in equilibrium prices implies market-level quantity decreases. At the market-carrier level, however, quantity could increase or decrease. To see why, consider a market with two carriers, each of which has constant marginal costs. Assume the marginal cost for the second carrier is slightly higher than that of the first carrier. Under separate ownership, the two carriers produce (approximately) the Cournot equilibrium quantities. Now consider the case in which the same shareholder owns both carriers. In this case, it is in the interest of the shareholder to have the first carrier produce the monopoly quantity, and the second carrier to produce zero, because the first carrier has lower production costs (Farrell and Shapiro, 1990). Thus, although an increase in common ownership has a negative effect on quantity for the market as a whole, at the carrier level, the effect can go either way: quantity could increase for the first carrier and decline for the second carrier. Because of this ambiguity in theoretical predictions, we run the quantity regressions at the market level only.

First, an untabulated test we ran is a dynamic specification including the contemporaneous MHHI delta and HHI, one lag of MHHI delta and HHI, and one lead of the MHHI delta and HHI, including all controls, at the market-carrier level. We find a negative correlation between future MHHI delta on prices.

Next, we conduct a robustness test that may lend support to the hypothesized mechanism of active "engagement" by large asset management companies. We investigate whether there are route-level differences in the effect of common ownership on ticket prices, and in particular whether there is an interaction between the degree of concentration measured by HHI and the effect of MHHI delta. Such an interaction effect could arise because it might be more difficult to enforce soft competition among a large number of relatively small competitors (that is, in low HHI routes), compared to a route in which only two players are present and have similar market shares (HHI in an intermediate range, e.g. 5,000). On the other end of the spectrum, there might be great scope in increasing monopolistic profits by creating common ownership in markets in which a small number of players still competes with a large player (i.e., markets with an HHI close to 10,000). On the other hand, there might be fewer such opportunities, making the effect more difficult to estimate. We investigate these hypotheses by running a price regression on MHHI delta interacted with a fifth-order polynomial of HHI, as well as all previously considered controls.[11]

The resulting average marginal effects of MHHI delta as a function of HHI (on a scale from 0 to 1), along with 95% confidence intervals of the effect, are depicted in Figure 8. Consistent with the above hypothesis that frictions prevent a significant of common ownership in markets with many similarly-sized competitors, the effect of MHHI delta only becomes significant above an HHI of approximately 2,500 (the threshold between "moderately concentrated" and "highly concentrated" markets according to the horizontal merger guidelines; an HHI of 2,500 obtains, for example, when four firms each have 25% market share). For an intermediate range of HHI values, from roughly 2,500 to 9,000, the effect of MHHI delta on ticket prices is approximately 0.2 to 0.3. At the right tail, for HHIs over 9,000, the point estimate for the MHHI delta coefficient is about 0.5, but the estimate becomes imprecise and indistinguishable from zero. These results indicate that the effect of MHHI delta is robust in magnitude and significance across a large number of routes. Moreover, the results appear consistent with the hypothesis that the efforts to soften competition motivated by common ownership are

[11] We thank Severin Borenstein for this suggestion.

concentrated in markets with a manageable number of competitors.

To address the concern that airline bankruptcies may affect our estimates, we exclude quarters in which one of the major sample airlines was in bankruptcy from the sample, retaining only the periods 2001Q4-2002Q2 and 2007Q2-2011Q3 (Table VIII). The estimates remain similar.

In untabulated tests, we include distance times year fixed effect interactions to ensure that the estimated effect of the MHHI delta is not generated by differences in price changes over time in longer and shorter routes, for example, due to a differential response to oil price changes. The results are similar to those of regressions without distance-time interactions. We also run specifications with carrier-time fixed effects. The effects stay highly statistically significant, indicating that the effect we measure cannot be due to firm(-pair) financial conditions, combined with correlated selling by common owners.

To ensure robustness to nonlinearities in the response of prices to market concentration, we also run specifications (untabulated) controlling for a fifth-order polynomial in the HHI. Estimates of the effect of MHHI delta on prices are very similar to those in the reported baseline specification.

A further robustness checks that may be informative about the corporate governance mechanism that implements the anti-competitive shareholder incentives is as follows. In the baseline specification reported previously, we calculate the MHHI delta using all shareholders larger than 0.5%. We now relax that restriction and include all shareholders present in the Thomson database. Including all shareholders has a minimal effect on the estimated coefficients. We then estimate specifications including, for a given carrier at each quarter, only the largest 10, largest 5, largest 3, and with only the single largest shareholder in the calculation of the MHHI delta. These specifications assign control rights equal to zero if the shareholder is not among the top N shareholders, but keeps ownership rights for all shareholders. This specification is thus based on MHHI deltas calcualted under the assumption that only the largest N shareholders influence corporate strategy to the level of product pricing. The results are shown in Table IX. Generally speaking, disregarding control rights by shareholders below the top five only slightly attenuates the results, but they remain highly statistically significant. Specifically, if we ignore control rights by shareholders outside the top 10, the coefficient on MHHI delta is 0.130 in the market-carrier-level specification and 0.194 in the market-level specification, both significant at the 1% level. Comparing these estimates to

the baseline regressions, we deduce that ignoring control rights outside the top 10 does not significantly alter the conclusions. Taking into account control rights by only the top five shareholders produces a coefficient on MHHI delta of 0.124 in the market-carrier specification and a coefficient of 0.170 in the market-level specification. Taking into account control rights of only the largest three shareholders attenuates the results some more. Although further attenuated, even common ownership by the single largest shareholder alone has a significant effect on prices in all specifications. The coefficient is 0.0685 in the market-carrier specification and 0.0788 in the market-level specification; both coefficients are significant at the 1% level. As a placebo test, we also run specifications that assume that only shareholders with *less* than 0.5% exercise control. These regressions do not result in significant coefficients with robust sign for MHHI delta. In sum, these results suggest that the control rights of the largest five to ten shareholders are most relevant for the implementation of the anti-competitive effects of common ownership regarding product pricing.

As a further untabulated robustness test, we find that the effect of MHHI delta is almost unchanged when we use the Evans and Kessides (1994) variables to measure multimarket contact, and also when we control for nonstop competition in adjacent markets that connect the same city pairs, similar to Brueckner, Lee, and Singer (2013).

5.4 Remaining Limitations

This subsection points out the two main limitations we see with our results. A first concern with the panel-IV estimates can be that some other shock differentially affected different airline routes after the 2009 recession, thus causing the divergence in prices. For example, it could be that routes that are used mostly for business travel are more affected by the economic recovery than routes flown by leisure passengers (irrespective of the fact that the pre-2009 trends are parallel), that different airlines had heterogeneous exposure to the more affected routes, and that BlackRock and BGI in 2009Q1 just happened to own particularly large blocks of shares in these carriers and these carriers alone, compared to other investors. Note that we employ route-fixed effects, which difference out such an effect. A slight variation of the argument could be that what is a "business" route and what is a "leisure" route changes over time, in a way that is correlated with BlackRock and BGI's pre-acquisition ownership in the ways described above. In that case, the route-fixed effects

would not pick up such an effect. To account for that possibility, we do control for economic conditions in departure and destination cities. However, this control could be imperfect. Because we do not have an instrument for time-varying exposure to economic recovery, this alternative remains a limitation.

A second limitation concerns the alternative hypothesis that the price increases are indeed due to common ownership, but reflect an increase in the quality of the good delivered rather than anti-competitive pricing. (Common owners could coordinate quality increases across carriers specifically in routes their airlines serve.) Leaving aside the decrease in quantity we measure which would somewhat contradict that hypothesis, this explanation could be a reasonable alternative hypothesis. Ideally, we would therefore like to control for quality in our regressions. Whereas flight delay data exist at the route level, to our knowledge, no paper in the literature to date uses it as controls or otherwise quality-adjusted prices. The reason is, as Forbes, Lederman, and Tombe (2015) (in a paper focused on quality in the airline industry) explain: "We choose not to include post-2000 data," among others because "the volume of the available data is so large that we are unable to estimate regressions that include all the airlines for a longer time period." Neither can we. As a result, this hypothesis remains a limitation of our analysis. Future work may address this concern, maybe focusing on industries with even more homogenous products.

6 Institutional Background: Passive Investors, but Active Owners

The focus of this paper is on documenting unilateral anti-competitive incentives implied by common ownership of firms, and on studying whether observed market prices are consistent with the implementation of these incentives. Because the institutional and legal environment of our setting may be less well understood, a brief discussion how such incentives could get implemented is in place, as well as an indication of whether our conclusions have the potential to be generalizable. To that end, we provide new evidence regarding the ubiquitous nature of common ownership. Second, we provide accounts by insiders of the asset management industry about the nature of voting and engagement between investors and their portfolio firms, shedding light specifically on corporate governance activities by

so-called "passive" investors. Third, we report legal scholars' assessments of the legality of such communications and other related problems.

Appendix Table V provides a list of the largest shareholders, along with their ownership percentage, of some of the most well-known firms in the United States. The overlap of shareholders across natural competitors is substantial. For example, BlackRock is the largest shareholder of each of the nation's largest three banks (JPMorgan Chase, Bank of America, and Citigroup); Vanguard, State Street, and Fidelity are among the top six shareholders in each of these banks as well. BlackRock is also the largest shareholder of both Apple and Microsoft. The top five shareholders of CVS and Walgreens are identical. These examples illustrate that large institutional investors, possibly as a mechanical effect of their size and portfolio diversification, generally tend to hold firms that are natural competitors. We conclude that the airline industry is not an unusual case with respect to their ownership structure.

These large diversified institutional shareholders are commonly labelled as "passive" investors. When using such labels, however, it is important to distinguish between their investment strategy and their corporate governance policies. For example, Vanguard explains their corporate governance engagements under the title "passive investors, not passive owners" (Booraem, 2014); the Financial Times, in an article titled "passive investment, active ownership," quotes the former head of corporate governance at TIAA-CREF as saying: "Having a passive investment strategy has nothing to do with your behaviour as an owner" (Scott, 2014); and BlackRock's chairman and CEO, Laurence D. Fink, does not tire to emphasize that "We are an active voice, ..." (Benoit, 2014). The distinction between passive investment and active ownership becomes more important as these investors' size and activity level increases.

The asset managers' fiduciary duty obliges them to vote in shareholder elections. As a result, they are not only an active voice, they also have power to determine executive compensation, retention, and the election of directors. The combined effect can be consistent with incentivizing the CEO to not only maximize the own firm's performance. For example, whereas CEOs are rarely fired (Taylor, 2010), CEO pay (Bertrand and Mullainathan, 2001) and turnover (Eisfeldt and Kuhnen, 2013; Jenter and Kanaan, forthcoming) in industrial firms is known to depend not only on individual firm performance but also on industry performance. Such schemes are consistent with the incentives of shareholders that are diversified

across firms within the same industry, but inconsistent with relative performance evaluation if performance is measured for each firm in isolation. Moreover, complying with shareholder demands to soften competition can act as a coordinating device that increases all firms' profits and stock price, even if a one-shot deviation would be profitable to an individual firm. As a result, even if CEOs were entirely incentivized based on their own firm's performance, following the largest shareholders' suggestions can be consistent with CEO incentives.

The institutional investors, being the largest investors of most firms, state that their voting rights give them substantial power in designing contracts according to their incentives. The head of corporate governance at State Street Global Advisors is quoted by Scott (2014), referring to voting power of SSgA's passive funds: "The option of exercising our substantial voting rights in opposition to management provides us with sufficient leverage and ensures our views and client interests are given due consideration." A different industry expert concludes that "They are generally such large investors and have such large positions that their vote is worth a lot. The last thing companies want is to have big investors vote against them." To illustrate the breadth of involvement in shareholder elections, consider that in 2012, BlackRock alone voted on 129,814 proposals at 14,972 shareholder meetings.

Importantly, the largest among institutional investors almost always form their own opinions about every item on the ballot, and coordinate the voting of all of their funds at the family level, as in a voting trust. For example, Vanguard "[has] an experienced team of analysts that independently evaluates each proposal and casts our funds' votes in accordance with our voting guidelines." Similarly, Laurence D. Fink, chairman and CEO of BlackRock, emphasizes that "we reach our voting decisions independently of proxy advisory firms" (Condon and Bhaktavatsalam, 2012).

Engagement is not limited to these examples. In a recent survey, McCahery, Starks, and Sautner (2014) find that "the majority of institutional investors ... are willing to engage in shareholder activism" or "behind-the-scenes" corporate governance, see also Dimson, Karakaş, and Li (forthcoming); see Carleton, Nelson, and Weisbach (1998); Becht, Bolton, and Röell (2007) for case studies. The nature of engagement activities comprises a variety of tools. BlackRock's Proxy Voting and Shareholder Engagement FAQ (updated February 2014) serve as an example: "We engaged with roughly 1,500 companies around the world in 2012. When we engage successfully and companies adjust their approach, most observers are never aware of that engagement. [...] We typically only vote against management when direct

engagement has failed. [...] Engagement encompasses a range of activities from brief conversations to a series of one-on-one meetings with companies." In personal communication, a corporate governance executive characterizes the relationship between engagement and voting as "the carrot and the stick," respectively. As with voting, engagement is by no means limited to fund families that predominantly host actively managed funds. To the contrary, the economic incentive to engage in corporate governance activities is greater for index funds (because they have longer horizons), and they often have more voting power, because they tend to be larger. To illustrate, Vanguard finds that "Because our funds own a significant portion of many companies (and in the case of index funds are practically permanent holders of companies), we have a vested interest in ensuring that these companies' governance ... practices support the creation of long-term value for investors." As a consequence, Vanguard also has "hundreds of direct discussions [with portfolio firms] every year."

It is difficult to imagine that the same principal who votes on a CEO's retention decision would at the same time be unable to influence aspects of firm policy that do not appear on the ballot. Yet, because behind-the-scenes engagement is private, it is difficult to know precisely which topics are discussed during engagement. BlackRock's 2011 Corporate Governance and Responsible Investment Annual Review makes this explicit: "Most of our engagements are nuanced and sensitive; ... We are extremely unlikely to use the media, make a statement at a shareholder meeting, propose a shareholder resolution or employ other public means in our engagement process." Vanguard is more positive, indicating, that "Through engagement, we're able to put issues on the table for discussion that aren't on the proxy ballot." More explicitly, the former legal counsel of a very large asset management firm indicated to us in personal communication that "high on the list of topics" discussed in engagement meetings is how portfolio firms can "throw the switch from developing market share to instead exercise market power to get margins up" in particular markets. "Antitrust considerations are generally not on the radar" during such conversations.

Some economist audiences asked us whether engagement to that extent is legal, and whether asset acquisitions are if they cause to anti-competitive concerns. We do not intend to contribute an original answer to this question, but merely report previous authors', legal scholars', and regulators' assessment. It appears that engagement activities of investors that claim the solely for investment exemption fall into a legal grey zone. Some antitrust regulators expressed to us the opinion that as long as investors only voice their unilateral

incentives to have higher prices in some markets than in others, neither investor nor portfolio firm executives risk the legal consequences of collusion (a coordinated effect). Others believe that at least a monetary penalty could be assessed for interfering with "basic business decisions" of the company while not filing schedule 13(d) (Pfunder, 2006). More generally, however, it has been noted previously that antitrust law provides limited guidance on issues related to competitive concerns caused by common ownership. For example, Section 7 of the Clayton Act forbids the acquisition of "any part" of the stock of a company if the effect were to "substantially lessen competition." An exemption is included, however, for entities "purchasing such stock (i) solely for investment and (ii) not using the same by voting or otherwise to bring about, or in attempting to bring about, the substantial lessening of competition." O'Brien and Salop (2000) write, "The courts have read this solely-for-investment exemption in two parts. First, the defendant must show that it made the stock acquisition solely for 'investment', a term not defined in the statute. Second, if that showing has been made, the plaintiff carries the burden of establishing that the stock is being used to bring about or attempt to bring about a substantial lessening of competition." Subsequent regulation has clarified the "solely for investment" exemption, although its interpretation continues to be the subject of legal debate. It is agreed, for example, that starting proxy fights or nominating directors for the board would render the exemption inapplicable.

For that reason, large institutional investors only rarely nominate directors for company boards. However, instead of starting campaigns, institutional investors selectively support other investors' campaigns. Of course, activist investors in turn seek large investors' support before campaigning to avoid wasting their votes and resources. According to Gelles and de la Merced (2014) and Katz and McIntosh (2014), in some cases, the institutional investors even give ideas to the activists or explicitly encourage hedge funds to take up an activist campaign. Similarly, Solomon (2014) reports that "Activists are gaining ground because institutional investors are increasingly willing to side with them, and even joining the fight (or ganging up, as some companies might say)." which could be interpreted as coordinated voting and engagement activities on behalf of common shareholders. Moreover, the corporate governance office of a large asset manager revealed to us that they regularly host meetings to which they invite activist investors and affected portfolio firms' top management. After both sides voice their opinions, the asset manager decides on how to vote.

From these examples, it is clear that "the boundary between long-only money managers

and activists is starting to blur." (Michael Carr, head of Goldman Sachs's mergers and acquisitions group in the Americas, as quoted by Gelles and de la Merced (2014).) We thus propose to consider common ownership links in studies of product market competition not only when these links are generated by "activist" investors (as is commonplace in regulatory practice already). We propose to also study common ownership by investors that are traditionally labelled as "passive," because they have the same, or even stronger, anti-competitive incentives than activists with shorter investment horizons.

In sum, although no communication may be necessary to implement unilateral anti-competitive incentives that arise from publicly known common ownership links, the above evidence suggests that frequent and active communication, explicitly also about product market strategy, does take place between the largest investors and their portfolio firms. Based on this evidence, we reject the notion that the worlds' largest and most powerful investors fail to create mechanisms that maximize their economic incentives. "The bottom line is that we believe that the vast majority of boards and management teams are appropriately focused on the same long-term value objectives as we are." (Booraem, 2014, on behalf of Vanguard).

While the observations of this section are not necessary for the reported empirical facts to obtain – namely that common ownership exists, is large, widespread, creates very large anti-competitive incentives, and that product prices reflect these incentives), the evidence presented in this section may suggest a plausible corporate governance mechanism: frequent communication ensures that managers know who their owners and their incentives are, whereas voting power ensures that managers act in accordance with their shareholders' incentives. A detailed discussion of the legal implications is outside the scope of this paper.

7 Conclusion

This paper presents evidence of anti-competitive incentives and price effects caused by common ownership of firms by diversified institutional investors. Specifically, we document that, in the airline industry, a modified index of market concentration that takes common ownership into account (the MHHI) indicates levels of market concentration that far exceed those indicated by the conventional measure of market concentration (the HHI), which does not take common ownership into account. The difference between average MHHI and HHI, which represents market concentration that is solely due to common ownership, is more than

10 times larger than what is presumed "to be likely to enhance market power," according to the Horizontal Merger Guidelines formulated by the US Antitrust Agencies.

Consistent with investors' economic incentives and established economic theory, we find that when firms don't have incentives to compete, they don't. Specifically, we present clean evidence using more than 10 years of market-firm-level panel data from the airline industry that common ownership has a large and significant positive effect on product prices. We then exploit variation in common ownership concentration generated by the merger of two large asset managers that arguably occurred for reasons unrelated to route-level differences in US airline ticket prices. In sum, we find that ticket prices are 3-10% higher because of common ownership, compared to a counterfactual world in which firms are separately owned, or in which firms entirely ignore their owners' anti-competitive incentives caused by common ownership. According to our IV estimates, the single acquisition of BGI by BlackRock caused U.S. airline ticket prices to increase by 0.6% on average. The economic significance of these estimates is large on its own. It becomes even more striking if the results generalize to other industries. Future studies will show.

Tackling the competitive risks due to common ownership presents non-trivial challenges, not only from a political standpoint but also from a conceptual perspective. Specifically, this paper points to a policy trilemma. Diversification combined with the axiom that well-governed firms should implement shareholders' incentives implies a decline of product market competition, and an associated deadweight loss for the economy. The three goals of (i) perfect shareholder diversification, (ii) firms' maximization of shareholder interests, and (iii) preservation of competitive product markets cannot be simultaneously achieved. The first two goals benefit shareholders, and are likely large. The increase of institutional ownership over the last decades presumably reflects the benefit these institutions generate for their shareholders. However, the third element is a thus-far largely ignored social cost. Uncompetitive product markets not only imply a deadweight loss for the macroeconomy, but also have redistributive consequences. What is the optimal tradeoff between the above three goals is an interesting question for future study. Moreover, if regulators were to declare product market competition the superordinate goal, more study is needed to determine which policies are best suited to reach that objective.

One clear policy implication arises, however, at a more practical level: empirical measures of market concentration should take ownership into account. This can be accomplished by

calculating MHHIs, which are already used instead of HHIs by antitrust authorities in cases in which owners are considered to be "active." We suggest to use MHHIs also in the context of the largest owners of most public companies, who consider themselves "passive investors, not passive owners." Doing so would make immediately clear that consolidation in the asset management industry has the potential to have larger anti-competitive effects than mergers of the natural competitors in the product market itself. Such events may deserve respectively more attention by regulators. Under this new measure, the consistent application of existing rules would also imply that mergers of large asset management companies require proof of absence of anti-competitive effects on the product market of any of the portfolio companies. Of course, before bold action is taken by regulators, further study is needed to establish the applicability of our results to other industries, to estimate optimal reporting thresholds, to determine the optimal size of asset management companies, and so on. The present paper merely intends to start the debate.

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Table I: Summary Statistics.

Data for the period 2001Q1-2013Q1 come from the Department of Transportation for airfares and market characteristics. Data on ownership come from 13f filings and proxy statements. We exclude routes with less than 20 passengers per day on average. The MHHI delta is the increase in concentration solely due to common ownership. Other variable definitions are provided in the online appendix.

	Mean	**Std. Dev.**	**Min.**	**Max.**	**N**
Market-Carrier Level:					
Average Fare	227.03	98.94	25	2498.62	1115482
Log Average Fare	5.35	0.36	3.22	7.82	1115482
HHI	4587.26	2086.19	971.16	10000	1115482
MHHI	6315.24	1650.32	2039.05	10178.68	1115482
MHHI delta	1727.98	1039.63	0	5701.32	1115482
Number of Nonstop Carriers	0.89	1.38	0	11	1115482
Southwest Indicator	0.09	0.29	0	1	1115482
Other LCC Indicator	0.09	0.29	0	1	1115482
Share of Passengers Traveling Connect, Market-Level	0.67	0.38	0	1	1115482
Share of Passengers Traveling Connect	0.87	0.31	0	1	1115482
Population	2.41	1.99	0.02	16.09	1089818
Income Per Capita	41.59	4.59	21.41	79.66	1089818
Fraction Institutional Ownership	0.77	0.28	0	1.34	1115482
Institutional Ownership Concentration	693.72	555.58	0	10000	1115482
Top 5 Holdings as Pct. of Total Institutional Holdings	0.44	0.13	0	1	1115482
Average Passengers	3719.99	11449.6	10	231666.33	1115482
Market-Level:					
Average Fare	216.9	71.86	29.66	1045.91	228890
Log Average Fare	5.33	0.33	3.39	6.95	228890
HHI	5202.09	2381.71	971.16	10000	228890
MHHI	6780.27	1791.24	2039.05	10178.68	228890
MHHI delta	1578.17	1098.79	0	5701.32	228890
Implied change of MHHI delta	91.286	64.936	0	281.59	228890
Number of Nonstop Carriers	0.82	1.29	0	11	228890
Southwest Indicator	0.09	0.28	0	1	228890
Other LCC Indicator	0.08	0.28	0	1	228890
Share of Passengers Traveling Connect, Market-Level	0.65	0.4	0	1	228890
Share of Passengers Traveling Connect	0.65	0.4	0	1	228890
Population	2.26	1.95	0.02	16.09	222347
Income Per Capita	41.23	4.68	21.41	79.66	222347
Fraction Institutional Ownership	0.77	0.2	0	1.34	228890
Institutional Ownership Concentration	677.86	414.98	0	10000	228890
Top 5 Holdings as Pct. of Total Institutional Holdings	0.44	0.09	0	1	228890
Average Passengers	18323.88	33134.41	1800	359761	228890

Table II: Effect of Common Ownership on Airline Ticket Prices: Panel Regressions.

Common ownership is measured as MHHI delta. Data are for the period 2001Q1-2013Q1. We exclude routes with less than 20 passengers per day on average. For the market-carrier-level regressions, we weight by average passengers for the market carrier over time and cluster standard errors at the market level. For the market-level regressions, we weight by average passengers in the market over time and cluster standard errors at the market level. The MHHI delta is the increase in concentration solely due to common ownership. Other variable definitions are provided in the online appendix. While throughout the paper the HHI and MHHI are expressed on a scale of 0 to 10,000, we use a scale of 0 to 1 for the regressions.

	Dependent Variable: Log(Average Fare)					
	Market-carrier level			Market-level		
	(1)	(2)	(3)	(4)	(5)	(6)
MHHI delta	0.201***	0.128***	0.129***	0.299***	0.165***	0.212***
	(0.0251)	(0.0232)	(0.0232)	(0.0283)	(0.0249)	(0.0246)
HHI	0.208***	0.150***	0.152***	0.342***	0.260***	0.279***
	(0.0209)	(0.0182)	(0.0182)	(0.0262)	(0.0206)	(0.0216)
Number of Nonstop Carriers		-0.0112***	-0.0108***		-0.0101***	-0.00910***
		(0.00245)	(0.00244)		(0.00276)	(0.00275)
Southwest Indicator		-0.120***	-0.117***		-0.151***	-0.139***
		(0.0131)	(0.0130)		(0.0160)	(0.0158)
Other LCC Indicator		-0.0578***	-0.0588***		-0.0953***	-0.0999***
		(0.00776)	(0.00769)		(0.00859)	(0.00844)
Share of Passengers Traveling Connect, Market-Level		0.125***	0.127***		0.189***	0.194***
		(0.0155)	(0.0155)		(0.0159)	(0.0155)
Share of Passengers Traveling Connect		0.0711***	0.0699***			
		(0.0107)	(0.0107)			
Population		-0.0295	-0.0367		0.00119	-0.0276
		(0.0289)	(0.0291)		(0.0279)	(0.0283)
Income Per Capita		0.00447**	0.00474**		0.00443**	0.00509**
		(0.00203)	(0.00203)		(0.00203)	(0.00201)
Fraction Institutional Ownership			-0.0178***			-0.126***
			(0.00524)			(0.0121)
Institutional Ownership Concentration			0.0473**			0.120***
			(0.0219)			(0.0459)
Top 5 Holdings as Pct. of Total Institutional Holdings			0.0476***			0.121***
			(0.0115)			(0.0241)
Year FE	✓	✓	✓	✓	✓	✓
Market-Carrier FE	✓	✓	✓	✓	✓	✓
Observations	1,115,482	1,089,818	1,089,818	228,890	222,347	222,347
R-squared	0.095	0.144	0.146	0.160	0.263	0.279
Number of Market-Carrier Pairs	50,659	49,057	49,057			
Number of Markets				7,391	7,081	7,081

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table III: Effect of Common Ownership on Airline Ticket Prices: IV Regressions, First Stage.

Common ownership is measured as MHHI delta. The pre-period is 2009Q1 (the quarter before the Barclays BGI acquisition by BlackRock was announced). We divide markets into treatment and control groups as follows: (i) we calculate the actual MHHI delta in 2009Q1, (ii) we calculate a counterfactual MHHI delta in 2009Q1 combining the holdings of Barclays and BlackRock, (iii) we calculate the difference between the counterfactual and the actual for each market, (iv) markets in the top tercile of the difference between counterfactual and actual MHHI delta are assigned to the treatment group; markets in the bottom tercile are assigned to the control group. In the discrete-treatment specifications, we instrument the MHHI delta with the treatment status interacted with a post-period dummy. In the continuous-treatment specifications, we instrument the MHHI delta with the difference between the "counterfactual" MHHI delta generated by combining the holdings of Barclays and BlackRock in 2009Q1 and the actual MHHI delta in 2009Q1, interacted with a post-period dummy. We exclude markets with less than 20 passengers per day on average. We exclude market carriers with missing observations during the period 2009Q1-2013Q1. We weight by average passengers for the market- arrier over time. We use population and income per capita for 2012Q4 for the 2013Q1 observations. Standard errors are clustered at the market-carrier level. Variable definitions are provided in the online appendix. While throughout the paper the HHI and MHHI are expressed on a scale of 0 to 10,000, we use a scale of 0 to 1 for the regressions.

	Dependent Variable: MHHI delta							
	Discrete Treatment				Continuous Treatment			
Post-period:	2011Q1	2012Q1	2013Q1	2011-2013 Q1	2011Q1	2012Q1	2013Q1	2011-2013 Q1
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treat × Post	0.0651***	0.0885***	0.0879***	0.0749***				
	(0.00504)	(0.00508)	(0.00519)	(0.00447)				
Implied Change in MHHI delta × Post					4.050***	5.756***	5.740***	4.742***
					(0.291)	(0.295)	(0.313)	(0.273)
HHI	-0.365***	-0.377***	-0.376***	-0.354***	-0.365***	-0.372***	-0.372***	-0.354***
	(0.0273)	(0.0213)	(0.0225)	(0.0162)	(0.0214)	(0.0156)	(0.0159)	(0.0113)
Number of Nonstop Carriers	0.00634**	0.00270	0.00483*	0.00276*	0.00528***	0.00392*	0.00643***	0.00374***
	(0.00247)	(0.00266)	(0.00248)	(0.00165)	(0.00194)	(0.00208)	(0.00180)	(0.00132)
Southwest Indicator	0.0247*	0.0164*	0.00916	0.0157***	0.0183	0.0125	0.00756	0.0117**
	(0.0148)	(0.00881)	(0.00850)	(0.00562)	(0.0116)	(0.00763)	(0.00717)	(0.00504)
Other LCC Indicator	-0.0625***	-0.0629***	-0.0650***	-0.0621***	-0.0620***	-0.0742***	-0.0716***	-0.0690***
	(0.0132)	(0.0125)	(0.00946)	(0.00708)	(0.0113)	(0.0111)	(0.00817)	(0.00597)
Share of Passengers Traveling Connect, Market-Level	0.0543***	0.0839***	0.0857***	0.0815***	0.0352**	0.0581***	0.0695***	0.0652***
	(0.0204)	(0.0197)	(0.0180)	(0.0130)	(0.0166)	(0.0158)	(0.0142)	(0.0101)
Share of Passengers Traveling Connect	-0.0243***	-0.0378***	-0.0337***	-0.0311***	-0.0161***	-0.0307***	-0.0256***	-0.0245***
	(0.00489)	(0.00503)	(0.00753)	(0.00465)	(0.00444)	(0.00412)	(0.00590)	(0.00367)
Population	-0.0995***	-0.0475**	-0.0745***	-0.0613***	-0.174***	-0.0853***	-0.0983***	-0.0905***
	(0.0307)	(0.0229)	(0.0262)	(0.0232)	(0.0311)	(0.0185)	(0.0208)	(0.0188)
Income Per Capita	-0.00180	-0.00247	-0.00173	-0.00452***	0.00109	0.00155	0.00165	-0.00176
	(0.00193)	(0.00167)	(0.00176)	(0.00162)	(0.00198)	(0.00157)	(0.00166)	(0.00151)
Fraction Institutional Ownership	-0.0906***	-0.0780***	-0.0168**	-0.0250***	-0.0980***	-0.0838***	-0.0256***	-0.0324***
	(0.0116)	(0.00890)	(0.00801)	(0.00674)	(0.0103)	(0.00731)	(0.00672)	(0.00574)
Institutional Ownership Concentration	0.743***	0.517***	0.542***	0.446***	0.927***	0.590***	0.821***	0.688***
	(0.163)	(0.157)	(0.200)	(0.120)	(0.161)	(0.134)	(0.187)	(0.116)
Top 5 Holdings as Pct. of Total Institutional Holdings	0.00226	-0.109***	-0.0442	-0.0676**	0.00927	-0.0895***	-0.0896**	-0.105***
	(0.0370)	(0.0370)	(0.0390)	(0.0274)	(0.0335)	(0.0307)	(0.0349)	(0.0245)
(Share DL × Share NW in 2008Q4) × Post	0.590***	0.661***	0.562***	0.645***	0.528***	0.681***	0.574***	0.639***
	(0.164)	(0.153)	(0.150)	(0.158)	(0.103)	(0.103)	(0.0995)	(0.102)
(Share UA × Share CO in 2010Q2) × Post	0.215	0.508***	0.416**	0.374**	0.380**	0.628***	0.580***	0.558***
	(0.143)	(0.152)	(0.175)	(0.154)	(0.165)	(0.165)	(0.188)	(0.177)
Max Share AA × Post	0.0406***	0.0251***	0.0295***	0.0395***	0.0327***	0.00830	0.0111	0.0256***
	(0.00695)	(0.00738)	(0.00847)	(0.00704)	(0.00646)	(0.00670)	(0.00748)	(0.00654)
Year FE	✓	✓	✓	✓	✓	✓	✓	✓
Market-Carrier FE	✓	✓	✓	✓	✓	✓	✓	✓
Observations	14,828	14,828	14,828	29,656	23,334	23,334	23,334	46,668
R-squared	0.562	0.659	0.710	0.590	0.534	0.647	0.715	0.584
Number of Market-Carrier Pairs	7,414	7,414	7,414	7,414	11,667	11,667	11,667	11,667

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table III: (continued). Effect of Common Ownership on Airline Ticket Prices: IV Regressions: Second Stage.

Common ownership is measured as MHHI delta. The pre-period is 2009Q1 (the quarter before the Barclays BGI acquisition by BlackRock was announced). We divide markets into treatment and control groups as follows: (i) we calculate the actual MHHI delta in 2009Q1, (ii) we calculate a counterfactual MHHI delta in 2009Q1 combining the holdings of Barclays and BlackRock, (iii) we calculate the difference between the counterfactual and the actual for each market, (iv) markets in the top tercile of the difference between counterfactual and actual MHHI delta are assigned to the treatment group; markets in the bottom tercile are assigned to the control group. In the discrete treatment specifications, we instrument the MHHI delta with the treatment status interacted with a post-period dummy. In the continuous-treatment specifications, we instrument the MHHI delta with the difference between the "counterfactual" MHHI delta generated by combining the holdings of Barclays and BlackRock in 2009Q1 and the actual MHHI delta in 2009Q1, interacted with a post-period dummy. We exclude markets with less than 20 passengers per day on average. We exclude market carriers with missing observations during the period 2009Q1-2013Q1. We weight by average passengers for the market carrier over time. We use population and income per capita for 2012Q4 for the 2013Q1 observations. Standard errors are clustered at the market-carrier level. Variable definitions are provided in the online appendix. While throughout the paper the HHI and MHHI are expressed on a scale of 0 to 10,000, we use a scale of 0 to 1 for the regressions.

	Dependent Variable: Log(Average Fare)							
	Discrete Treatment				Continuous Treatment			
Post-period:	2011Q1	2012Q1	2013Q1	2011-2013 Q1	2011Q1	2012Q1	2013Q1	2011-2013 Q1
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
MHHI delta	-0.0150	0.519***	0.521***	0.299**	-0.149	0.483***	0.440***	0.245*
	(0.174)	(0.143)	(0.147)	(0.141)	(0.173)	(0.131)	(0.141)	(0.138)
HHI	0.0632	0.296***	0.299***	0.226***	0.0118	0.260***	0.254***	0.206***
	(0.0822)	(0.0672)	(0.0697)	(0.0605)	(0.0768)	(0.0573)	(0.0617)	(0.0553)
Number of Nonstop Carriers	0.0153**	0.00612	0.0157**	0.0110**	0.0142***	0.00475	0.00816	0.00810**
	(0.00697)	(0.00665)	(0.00694)	(0.00456)	(0.00503)	(0.00510)	(0.00550)	(0.00369)
Southwest Indicator	-0.149***	-0.178***	-0.164***	-0.121***	-0.123***	-0.148***	-0.130***	-0.103***
	(0.0416)	(0.0284)	(0.0223)	(0.0158)	(0.0451)	(0.0284)	(0.0199)	(0.0170)
Other LCC Indicator	-0.100***	-0.108**	-0.0669***	-0.0716***	-0.0959***	-0.0940***	-0.0516**	-0.0646***
	(0.0374)	(0.0420)	(0.0256)	(0.0186)	(0.0327)	(0.0320)	(0.0206)	(0.0160)
Share of Passengers Traveling Connect, Market-Level	0.194***	0.175***	0.182***	0.193***	0.217***	0.172***	0.170***	0.198***
	(0.0597)	(0.0615)	(0.0575)	(0.0421)	(0.0462)	(0.0465)	(0.0443)	(0.0321)
Share of Passengers Traveling Connect	0.1000***	0.0910***	0.0840***	0.0862***	0.0869***	0.0745***	0.0677***	0.0674***
	(0.0345)	(0.0320)	(0.0312)	(0.0266)	(0.0271)	(0.0253)	(0.0244)	(0.0204)
Population	-0.180*	-0.179***	-0.0449	-0.136**	-0.190**	-0.145**	-0.0539	-0.122**
	(0.0922)	(0.0604)	(0.0641)	(0.0563)	(0.0852)	(0.0579)	(0.0534)	(0.0503)
Income Per Capita	0.00551	0.0144***	0.0258***	0.0152***	0.00588	0.0166***	0.0240***	0.0161***
	(0.00470)	(0.00429)	(0.00498)	(0.00404)	(0.00424)	(0.00373)	(0.00429)	(0.00351)
Fraction Institutional Ownership	-0.0785**	-0.0440	-0.0426	-0.0607***	-0.0918***	-0.0377	-0.0338	-0.0695***
	(0.0348)	(0.0371)	(0.0259)	(0.0235)	(0.0322)	(0.0303)	(0.0218)	(0.0196)
Institutional Ownership Concentration	2.132***	1.281**	2.674***	1.769***	1.856***	1.070**	2.533***	1.519***
	(0.481)	(0.577)	(0.663)	(0.430)	(0.459)	(0.517)	(0.586)	(0.391)
Top 5 Holdings as Pct. of Total Institutional Holdings	-0.307***	-0.270**	-0.547***	-0.381***	-0.282***	-0.259**	-0.522***	-0.341***
	(0.109)	(0.137)	(0.124)	(0.0892)	(0.0973)	(0.115)	(0.109)	(0.0797)
(Share DL × Share NW in 2008Q4) × Post	0.297	0.394	0.322	0.381	0.176	0.174	0.250	0.232
	(0.252)	(0.289)	(0.289)	(0.249)	(0.213)	(0.240)	(0.247)	(0.212)
(Share UA × Share CO in 2010Q2) × Post	1.066***	0.702**	1.470***	1.112***	1.207***	0.626*	1.247***	1.029***
	(0.212)	(0.354)	(0.288)	(0.226)	(0.218)	(0.321)	(0.285)	(0.215)
Max Share AA × Post	0.0309	0.0351*	0.00480	0.0214	0.0294*	0.0490***	0.00931	0.0251
	(0.0208)	(0.0213)	(0.0223)	(0.0209)	(0.0175)	(0.0181)	(0.0175)	(0.0167)
Year FE	✓	✓	✓	✓	✓	✓	✓	✓
Market-Carrier FE	✓	✓	✓	✓	✓	✓	✓	✓
Observations	14,828	14,828	14,828	29,656	23,334	23,334	23,334	46,668
R-squared	0.375	0.432	0.414	0.321	0.351	0.411	0.395	0.305
Number of Market-Carrier Pairs	7,414	7,414	7,414	7,414	11,667	11,667	11,667	11,667

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table IV: Effect of Common Ownership on Airline Ticket Prices: OLS Regressions with IV Sample.

Common ownership is measured as MHHI delta. The pre-period is 2009Q1 (the quarter before the Barclays BGI acquisition by BlackRock was announced). We exclude markets with less than 20 passengers per day on average. We exclude market carriers with missing observations during the period 2009Q1-2013Q1. We weight by average passengers for the marketcarrier over time. We use population and income per capita for 2012Q4 for the 2013Q1 observations. Standard errors are clustered at the market-carrier level. Variable definitions are provided in the online appendix. While throughout the paper the HHI and MHHI are expressed on a scale of 0 to 10,000, we use a scale of 0 to 1 for the regressions.

	Dependent Variable: Log(Average Fare)			
Post-period:	2011Q1	2012Q1	2013Q1	2011-2013 Q1
	(1)	(2)	(3)	(4)
MHHI delta	0.132*	0.292***	0.212***	0.205***
	(0.0779)	(0.0787)	(0.0678)	(0.0525)
HHI	0.105*	0.199***	0.182***	0.193***
	(0.0542)	(0.0464)	(0.0467)	(0.0330)
Number of Nonstop Carriers	0.0133***	0.00485	0.00896*	0.00814**
	(0.00508)	(0.00496)	(0.00532)	(0.00364)
Southwest Indicator	-0.130***	-0.144***	-0.122***	-0.103***
	(0.0445)	(0.0282)	(0.0177)	(0.0167)
Other LCC Indicator	-0.0799**	-0.108***	-0.0672***	-0.0673***
	(0.0312)	(0.0325)	(0.0196)	(0.0140)
Share of Passengers Traveling Connect, Market-Level	0.212***	0.180***	0.184***	0.200***
	(0.0467)	(0.0444)	(0.0416)	(0.0306)
Share of Passengers Traveling Connect	0.0920***	0.0684***	0.0616***	0.0664***
	(0.0266)	(0.0241)	(0.0229)	(0.0197)
Population	-0.141*	-0.159***	-0.0744	-0.125***
	(0.0796)	(0.0546)	(0.0500)	(0.0475)
Income Per Capita	0.00676	0.0157***	0.0230***	0.0158***
	(0.00426)	(0.00361)	(0.00422)	(0.00341)
Fraction Institutional Ownership	-0.0671**	-0.0493*	-0.0346	-0.0702***
	(0.0264)	(0.0279)	(0.0215)	(0.0191)
Institutional Ownership Concentration	1.842***	1.038**	2.434***	1.516***
	(0.465)	(0.521)	(0.576)	(0.392)
Top 5 Holdings as Pct. of Total Institutional Holdings	-0.286***	-0.275**	-0.505***	-0.342***
	(0.0985)	(0.113)	(0.107)	(0.0793)
(Share DL × Share NW in 2008Q4) × Post	-0.0454	0.387*	0.497**	0.274
	(0.183)	(0.214)	(0.216)	(0.176)
(Share UA × Share CO in 2010Q2) × Post	1.081***	0.764**	1.408***	1.055***
	(0.188)	(0.312)	(0.267)	(0.206)
Max Share AA × Post	0.0196	0.0529***	0.0145	0.0262*
	(0.0160)	(0.0176)	(0.0169)	(0.0157)
Year FE	✓	✓	✓	✓
Market-Carrier FE	✓	✓	✓	✓
Observations	23,334	23,334	23,334	46,668
R-squared	0.358	0.414	0.399	0.305
Number of Market-Carrier Pairs	11,667	11,667	11,667	11,667

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

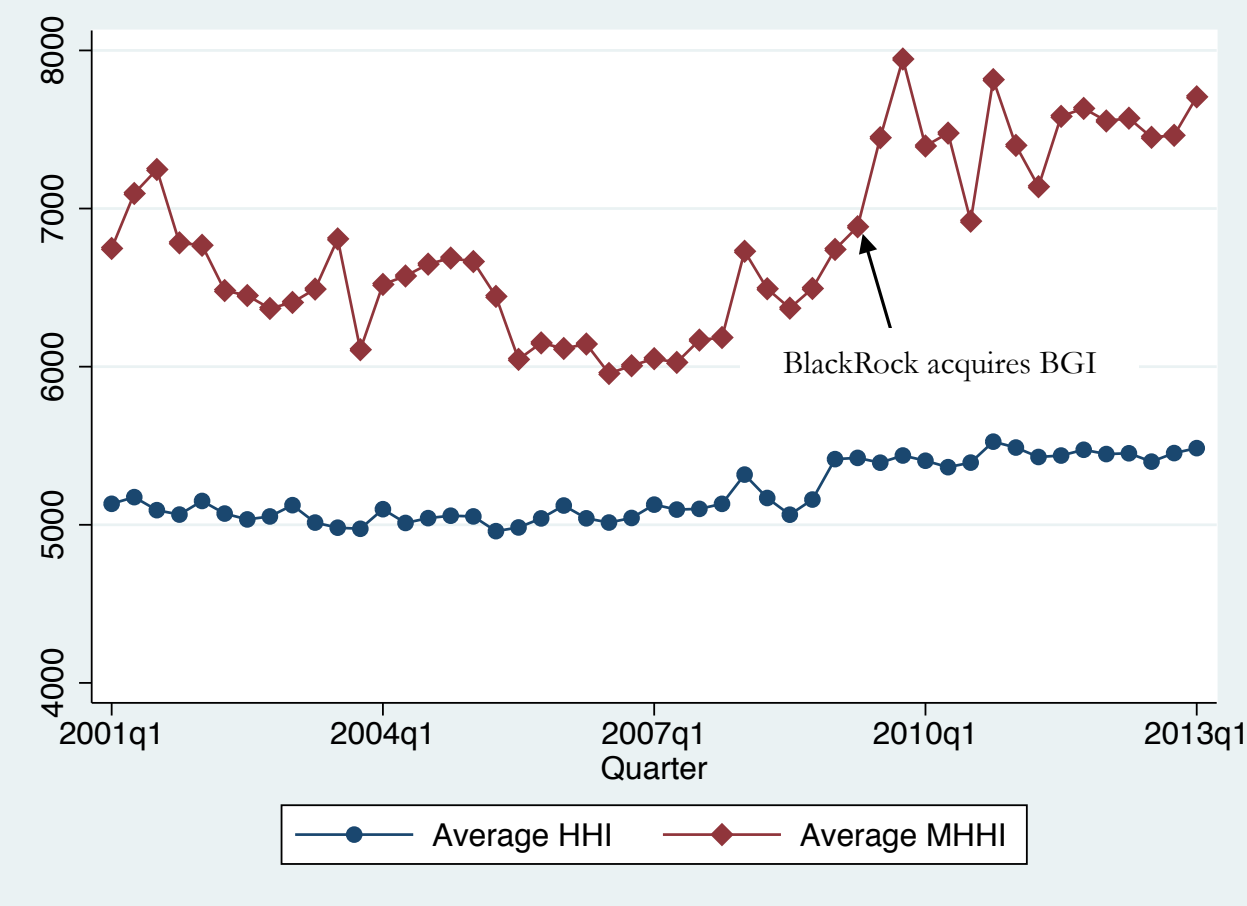

Figure 1: HHI and MHHI over time.

The HHI is the Herfindahl-Hirschman Index. We calculate the index as the sum of the market shares squared at a given route and year-quarter. We exclude international carriers and charter carriers. The MHHI is the modified HHI of O'Brien and Salop (2000). We calculate the index using the formula $MHHI = HHI + \sum_{k \neq j} s_j s_k \frac{\sum_i \gamma_{ij} \beta_{ik}}{\sum_i \gamma_{ij} \beta_{ij}}$, where s_j is the market share of carrier j, γ_{ij} is proportional to the voting shares of shareholder i in carrier j, and β_{ij} is the share of carrier j owned by shareholder i. The MHHI delta, which is a measure of common ownership among airlines in a route, is the difference between the MHHI and the HHI. Averages are calculated across routes at a given point in time. We exclude routes with less than 20 passengers per day on average. Variable definitions are provided in the online appendix.

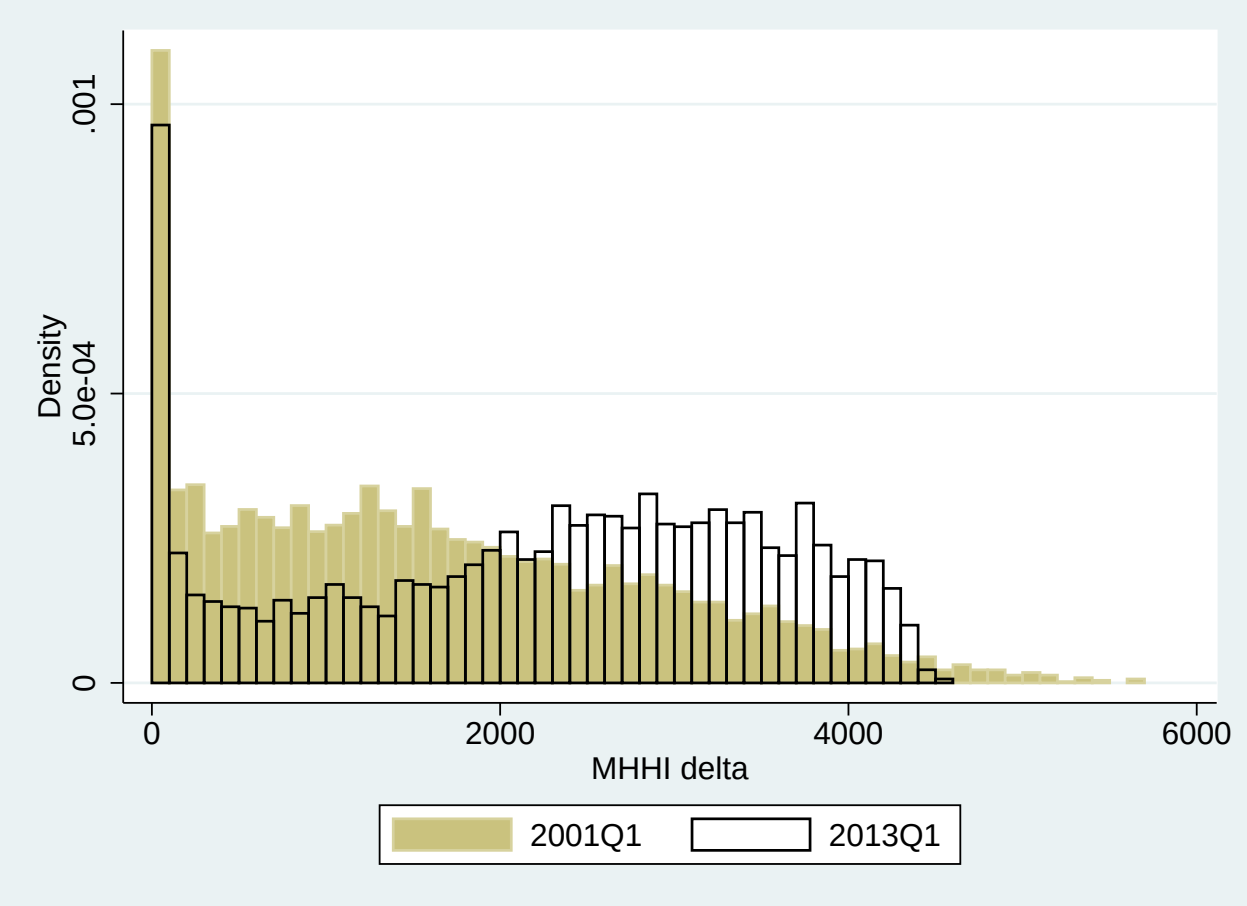

Figure 2: Distribution of MHHI delta across markets, 2001Q1 and 2013Q1.

The MHHI delta, which is a measure of common ownership among airlines in a route, is the difference between the MHHI and the HHI. The HHI is the Herfindahl-Hirschman Index. We calculate the index as the sum of the market shares squared at a given route and year-quarter. We exclude international carriers and charter carriers. The MHHI is the modified HHI of O'Brien and Salop (2000). We calculate the index using the formula $MHHI = HHI + \sum_{k \neq j} s_j s_k \frac{\sum_i \gamma_{ij}\beta_{ik}}{\sum_i \gamma_{ij}\beta_{ij}}$, where s_j is the market share of carrier j, γ_{ij} is proportional to the voting shares of shareholder i in carrier j, and β_{ij} is the share of carrier j owned by shareholder i. We exclude routes with less than 20 passengers per day on average. Variable definitions are provided in the online appendix.

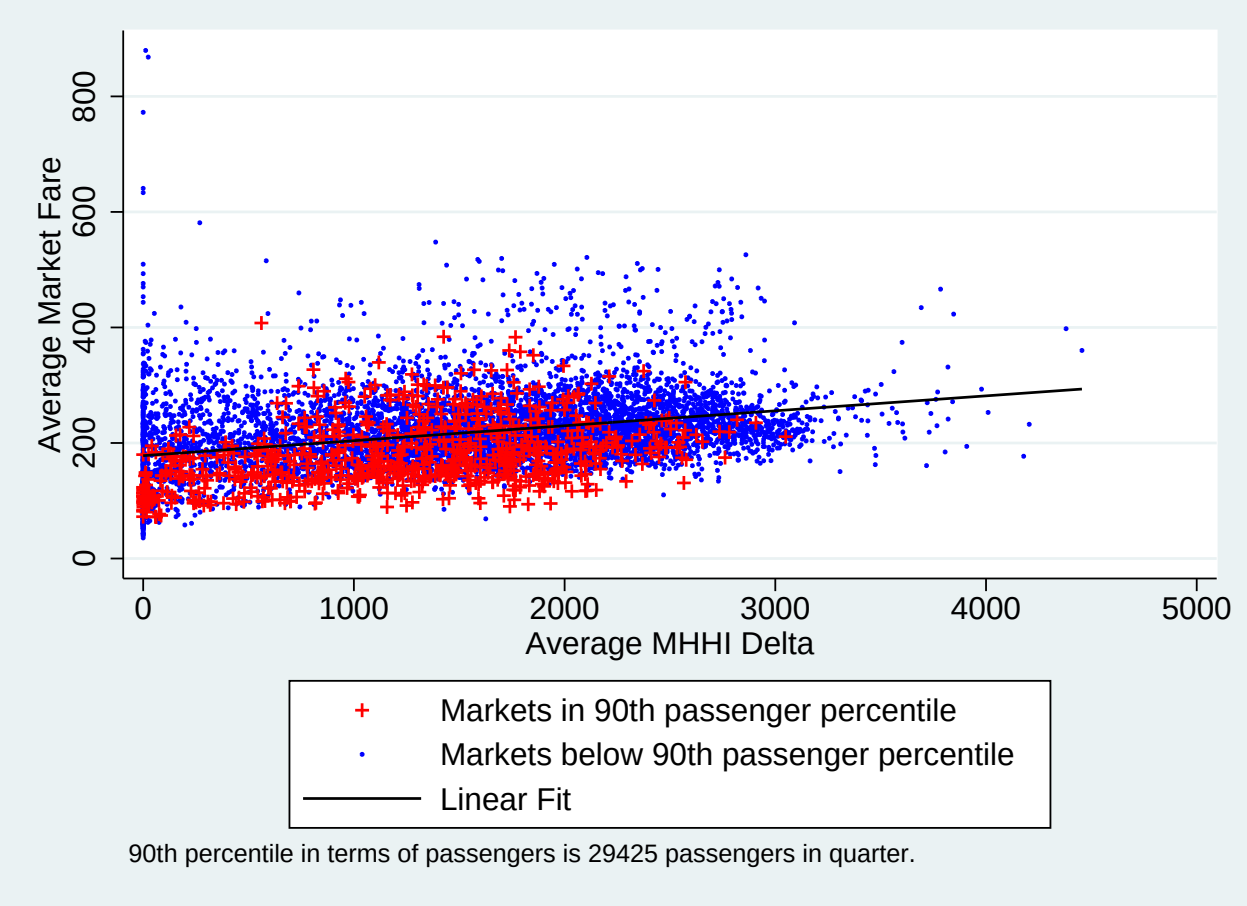

Figure 3: Raw correlation between average airfares and average MHHI delta at the market level, averages using data from 2001Q1 to 2013Q1.

The graph illustrates the raw cross-sectional correlation between airfares and MHHI delta. The MHHI delta, which is a measure of common ownership among airlines in a route, is the difference between the MHHI and the HHI. The HHI is the Herfindahl-Hirschman Index. We calculate the index as the sum of the market shares squared at a given route and year-quarter. We exclude international carriers and charter carriers. The MHHI is the modified HHI of O'Brien and Salop (2000). We calculate the index using the formula $MHHI = HHI + \sum_{k \neq j} s_j s_k \frac{\sum_i \gamma_{ij}\beta_{ik}}{\sum_i \gamma_{ij}\beta_{ij}}$, where s_j is the market share of carrier j, γ_{ij} is proportional to the voting shares of shareholder i in carrier j, and β_{ij} is the share of carrier j owned by shareholder i. We exclude routes with less than 20 passengers per day on average. Variable definitions are provided in the online appendix.

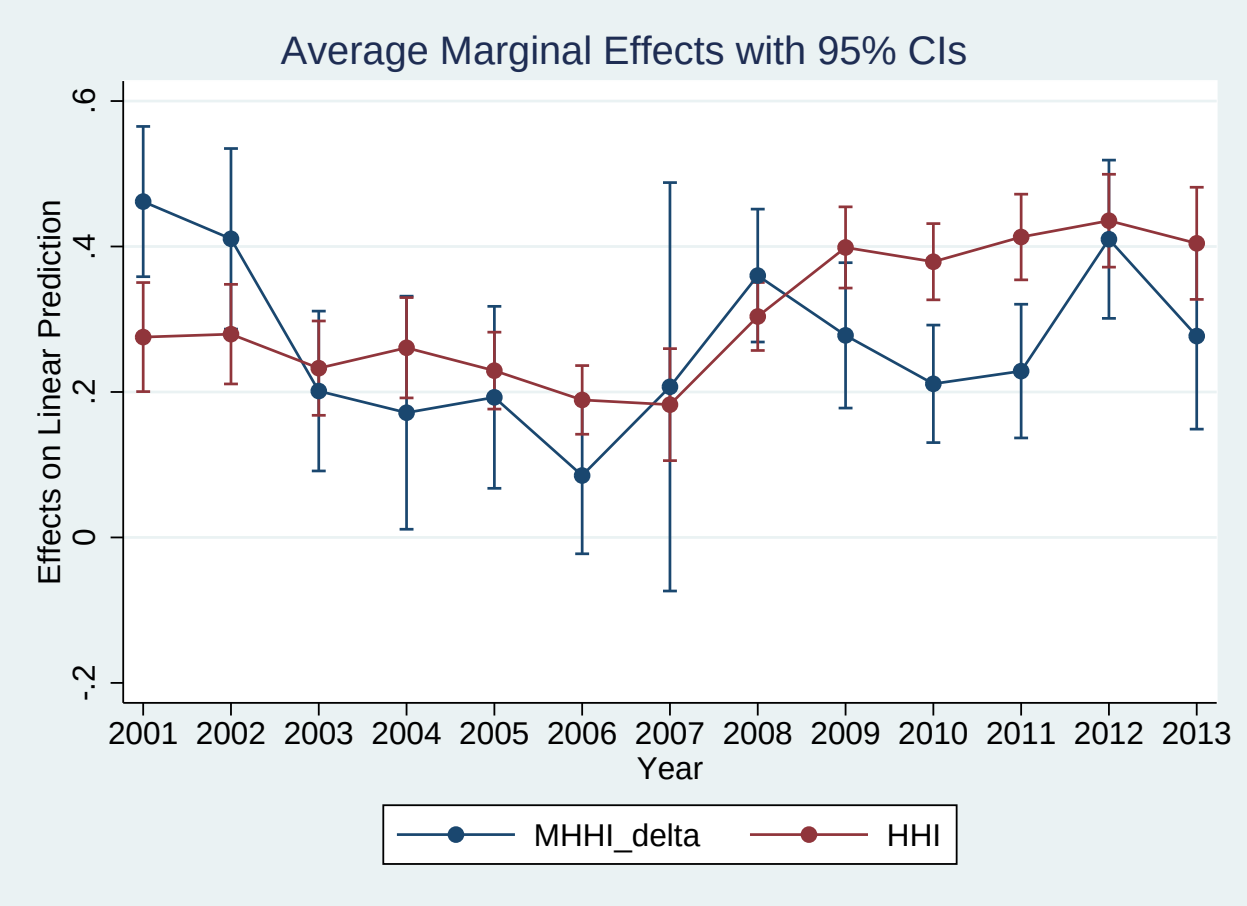

Figure 4: Estimated effect of HHI and MHHI delta on ticket prices, by year; market-level specification.

Based on a specification with market fixed effects and year-quarter fixed effects and all additional controls. Standard errors are clustered at the market-carrier level. The MHHI delta, which is a measure of common ownership among airlines in a route, is the difference between the MHHI and the HHI. The HHI is the Herfindahl-Hirschman Index. We calculate the index as the sum of the market shares squared at a given route and year-quarter. We exclude international carriers and charter carriers. The MHHI is the modified HHI of O'Brien and Salop (2000). We calculate the index using the formula $MHHI = HHI + \sum_{k \neq j} s_j s_k \frac{\sum_i \gamma_{ij} \beta_{ik}}{\sum_i \gamma_{ij} \beta_{ij}}$, where s_j is the market share of carrier j, γ_{ij} is proportional to the voting shares of shareholder i in carrier j, and β_{ij} is the share of carrier j owned by shareholder i. We exclude routes with less than 20 passengers per day on average. We weight observations by average passengers of the market over time. Variable definitions are provided in the online appendix.

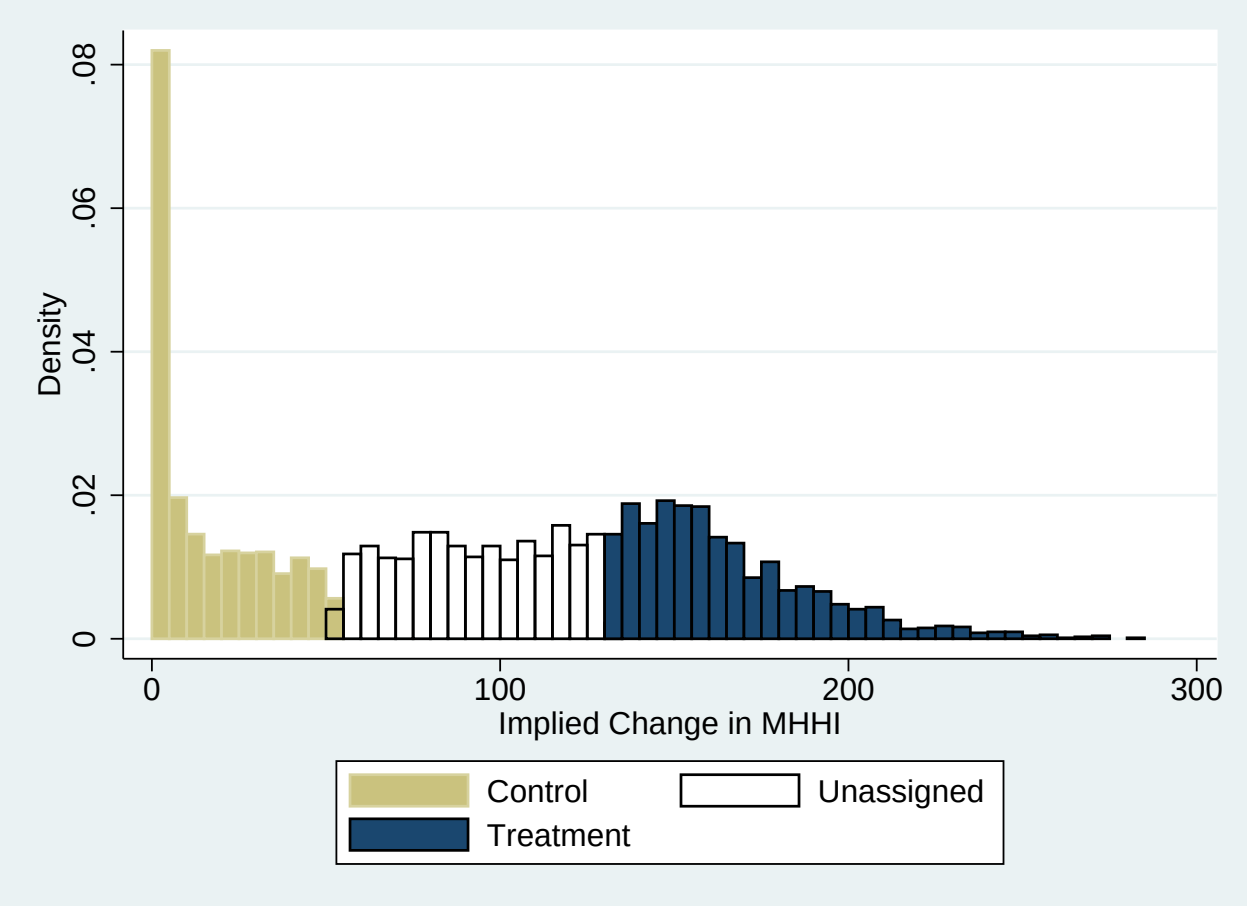

Figure 5: Distribution of implied MHHI delta across markets (BlackRock-BGI Panel-IV) .

The Implied MHHI delta reflects the increase of market concentration implied by the hypothetical combination of BlackRock's and Barclays Global Investors' equity portfolios in 2009Q1. The shaded areas are those markets used as treatment and controls in the discrete implementation of the instrument. We use the whole distribution in a continuous-treatment specification.

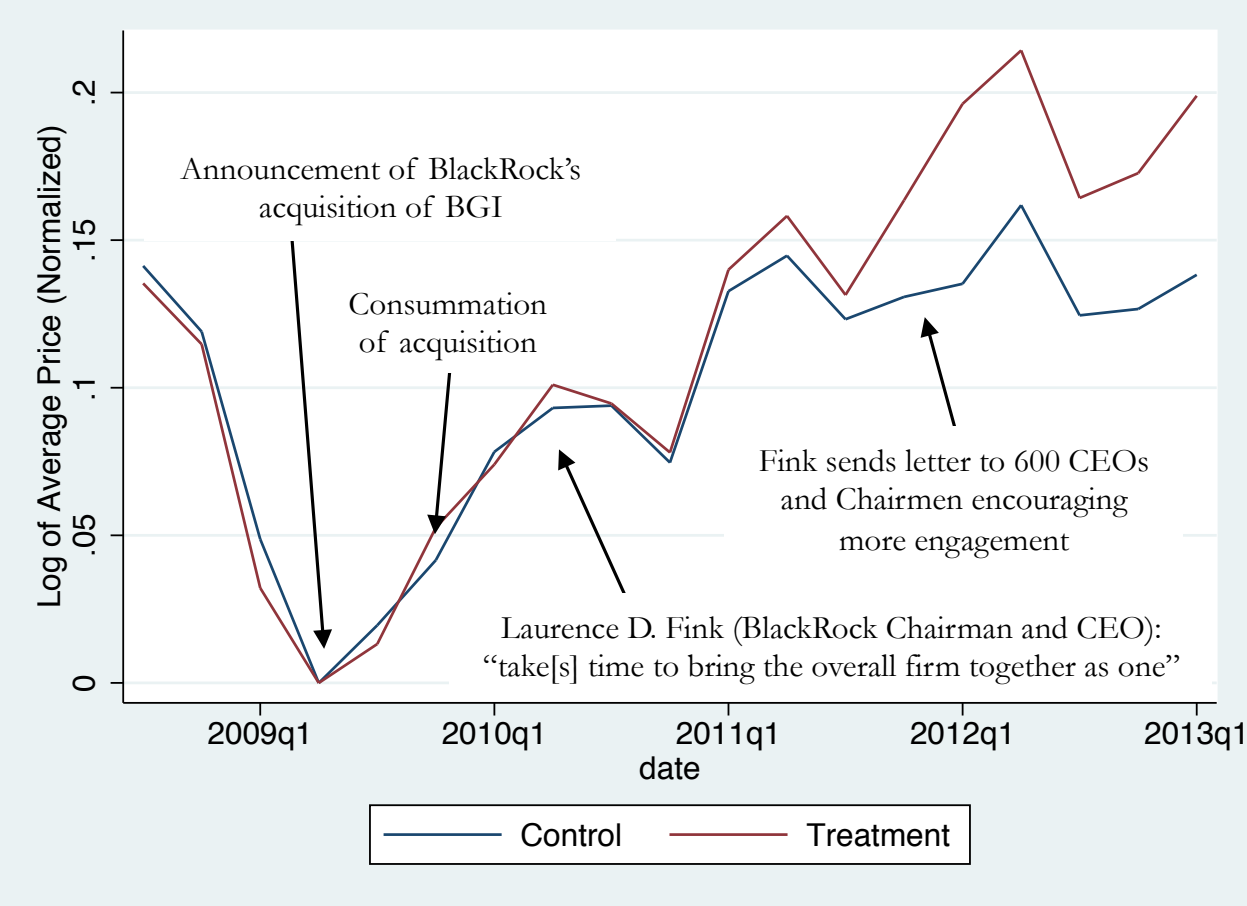

Figure 6: Average ticket prices in "treatment" and "control" markets of the BlackRock-BGI acquisition.

The graph plots ticket prices, normalized in 2009Q2 (the announcement quarter), averaged across all treated (control) routes belonging to the highest (lowest) tercile of markets sorted by the increase of market concentration implied by the hypothetical combination of BlackRock's and Barclays Global Investors' equity portfolios in 2009Q1, or "Implied MHHI delta."

A Appendix: Stylized Example

This appendix illustrates the theoretical idea and empirical strategy of the paper with a simple stylized example. Suppose that three routes connect three airports: BOS, JFK, and DCA. There are three airlines. Airline 1 operates the route BOS-JFK and BOS-DCA. Airline 2 serves DCA-JFK and BOS-JFK. Airline 3 flies DCA-JFK and DCA-BOS. Thus, two airlines serve each market, and every airline serves two markets. The following picture illustrates this market structure.

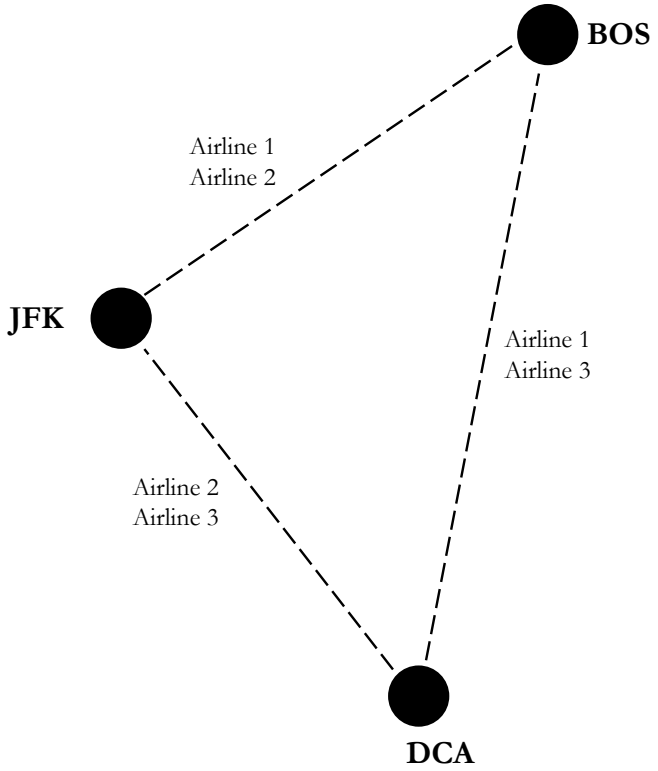

Figure 7: Illustration of the stylized example with three routes and three airlines.

Suppose the market share of any airline serving any of the markets is 50%. Then the traditional Herfindahl-Hirschman-Index of market concentration is $HHI = 0.5$ on all routes. (An economic interpretation of the HHI is that in a Cournot model, the HHI is proportional to the average industry markup.)

To start, assume that all airlines are separately owned. For example, Fund A owns 5% of Airline 1, Fund B owns 5% of Airline 2, and Fund C owns 5% of Airline 3; the remain-

ing ownership stakes are dispersed among atomistic individual shareholders that do not exercise their voting rights. Under this separate-ownership setup, the "modified Herfindahl-Hirschman-Index" is identical to the HHI on all routes, $MHHI = 0.5$, and the ownership structure of firms does not affect product prices.

Now assume that Fund B sells its ownership stake in Airline 2 to Fund A (or Fund A buys Fund B). Through this financial transaction (which does not constitute an airline merger as traditionally defined), Fund A becomes the single largest shareholder of both Airline 1 and Airline 2. Because Airline 1 and Airline 2 still have different names and their market shares do not change as a result of a transfer of ownership, this transaction does not affect the HHI. However, the $MHHI$ on the route served by Airline 1 and Airline 2 (BOS-JFK) jumps from 0.5 to 1, whereas other routes' $MHHI$s remain unchanged at 0.5 (note that no common ownership links exist between Airlines 1 and 3 and 2 and 3 even after the transaction between Fund A and Fund B). This increase in effective market concentration ($MHHI$) on the BOS-JFK route reflects the notion that the two airlines that Fund A controls are now a "joint monopolist" in this market. If they act in their common shareholder's interest, they will not compete away the producer surplus they could extract in the market they control: any gain in market share and profits that one firm could earn by decreasing prices away from monopolistic levels would come at the cost of reducing the *total* profits accruing to the two airlines, and therefore to Fund A. Under common ownership, both firms internalize the externality that aggressive competition imposes on the other firms in their common shareholder's portfolio. In the above example, the prediction of a Cournot model is that markups on the BOS-JFK route double as a result of the change in ownership structure, whereas markups stay unchanged on all other routes.

Our empirical strategy examines whether changes over time in route-level common ownership concentration are associated with changes over time in ticket prices on that same route. The empirical null hypothesis is that changes in common ownership links do not affect portfolio firms' product market behavior, for example, because of corporate governance frictions that impede the translation of shareholder interests in corresponding corporate strategies. The alternative hypothesis is that firms, at least to some extent, do act in their shareholders' interests, in which case variation across routes and over time in common ownership should be related to variation across routes and over time in ticket prices.

B Appendix: Examples of Common Ownership

Table V: Illustrative Cases of Within-industry Common Ownership Links.

This table shows the largest (institutional and *non-institutional*) owners and corresponding ownership stakes as of December 2013 – July 2014 (reporting dates vary) for a illustrative sample of US publicly traded natural competitors. For conciseness, we limit the table to the top five institutional shareholders of CVS and Walgreens, Apple and Microsoft, and the top 6 shareholders of the nation's three largest banks (JP Morgan Chase, Bank of America, and Citigroup). The data source is Osiris.

Panel A: Technology Firms

Apple	*[%]*	*Microsoft*	*[%]*
BlackRock	5.58	BlackRock	5.33
Vanguard	4.95	Capital Group	4.78
State Street Corporation	4.59	*– Bill Gates –*	*4.52*
Fidelity	3.28	Vanguard	4.49
Northern Trust Corporation	1.53	State Street Corporation	4.39
		Fidelity	3.08

Panel B: Pharmacies

CVS	*[%]*	*Walgreens*	*[%]*
BlackRock	5.9	Vanguard	5.26
Fidelity	5.1	State Street Corporation	4.49
Vanguard	4.78	BlackRock	4.44
State Street Corporation	4.61	Fidelity	3.07
Wellington Management Company	4.21	Wellington Management Company	2.29

Panel C: Banks

JP Morgan Chase	*[%]*	*Bank of America*	*[%]*	*Citigroup*	*[%]*
BlackRock	6.7	BlackRock	5.38	BlackRock	9.29
Vanguard Group	4.78	Vanguard Group	4.51	Capital Group	6.64
State Street Corporation	4.56	State Street Corporation	4.45	GIC Private Limited	5
Fidelity	3.16	Fidelity	2.56	State Street Corporation	4.4
Capital Group	2.7	JP Morgan Chase	1.48	Vanguard	4.4
Wellington Management	1.93	Citigroup	1.46	Fidelity	3.83

C Appendix: Airline Ownership

This appendix provides the names and ownership percentage of the ten largest shareholders of the three largest airline companies and JetBlue, constructed from 13F filings as of March 31, 2013 and SEC proxies as of March 15, 2013.

Wellington Management Co, LLP	6.3%
Vanguard Group, Inc.	5.2%
Capital Research & Mgmt Co	4.9%
BlackRock Investment Mgmt, LLC	4.7%
Lansdowne Ptnr Limited	4.1%
Wayzata Invt Partners, LLC	4.0%
Janus Capital Management, LLC	3.7%
Fidelity Management & Research	2.7%
Odey Asset Management, LLP	1.6%
Winslow Capital Mgmt, Inc.	1.6%

(a) Delta Air Lines, Inc.

Capital Research & Mgmt Co	14.0%
T. Rowe Price Associates, Inc.	13.9%
BlackRock Investment Mgmt, LLC	8.3%
Wellington Management Co, LLP	6.8%
Janus Capital Management, LLC	6.5%
Fidelity Management & Research	5.7%
Vanguard Group, Inc.	4.8%
GMT Capital Corp.	3.1%
Appaloosa Management, L.P.	2.6%
Evercore Trust Company, N.A.	2.3%

(b) United Airlines, Inc.

Primecap Management Company	11.2%
Vanguard Group, Inc.	6.2%
T. Rowe Price Associates, Inc.	5.3%
BlackRock Investment Mgmt, LLC	4.5%
Capital Research & Mgmt Co	4.3%
State Street Corporation	3.7%
Fidelity Management & Research	3.0%
Bankmont Financial Corp.	2.8%
Manning & Napier Advisors, Inc.	2.8%
Donald Smith & Co., Inc.	2.2%

(c) Southwest Airlines Co.

Deutsche Lufthansa	16.6%
Donald Smith & Co., Inc.	10.4%
Wellington Management Co, LLP	8.9%
Dimensional Fund Advisors, Inc.	8.0%
Primecap Management Company	7.6%
Fidelity Management & Research	6.9%
BlackRock Investment Mgmt, LLC	6.6%
Vanguard Group, Inc.	4.9%
Scopia Capital, LLC	3.9%
Eagle Asset Management, Inc.	3.2%

(d) JetBlue Airways Corporation

Table VI: Top ten shareholders and ownership percentage of Delta Air Lines, United Airlines, Southwest Airlines, and JetBlue Airways.

D Appendix: Additional Results and Robustness Checks

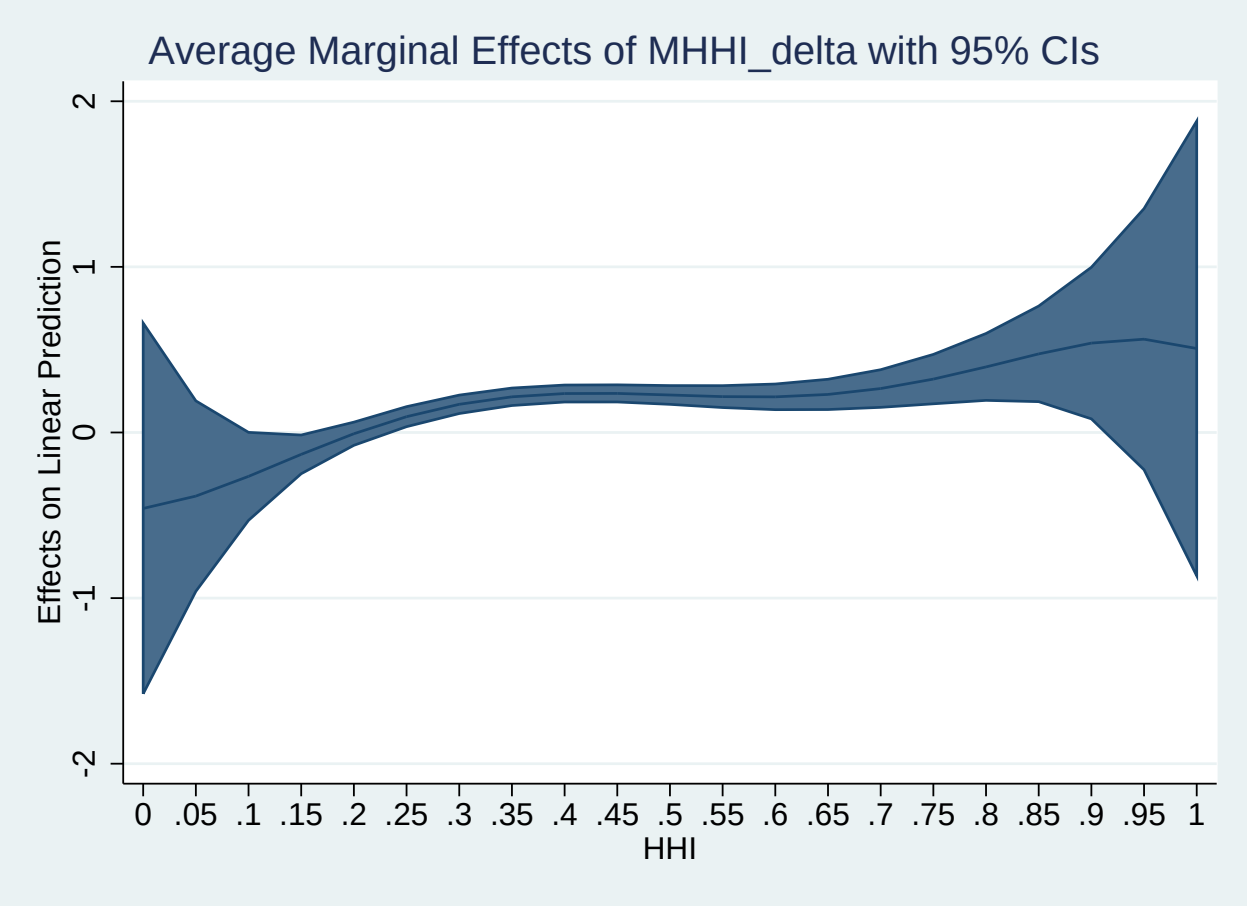

Figure 8: Effect of common ownership on ticket prices, by levels of market concentration measured by HHI.

This graph plots the effect of MHHI delta by HHI, whereas HHI is measure on a scale from 0 to 1. It is derived from a market-level regression of prices on all previously considered controls as well as MHHI delta interacted with a fifth-order polynomial in HHI.

Table VII: Effect of Common Ownership on Airline Market Passenger Volume.

Common ownership is measured as MHHI delta. Data are for the period 2001Q1-2013Q1. We exclude routes with less than 20 passengers per day on average. For the market-level regressions, we weight by average passengers in the market over time and cluster standard errors at the market level. The MHHI delta is the increase in concentration solely due to common ownership. Other variable definitions are provided in the online appendix. While throughout the paper the HHI and MHHI are expressed on a scale of 0 to 10,000, we use a scale of 0 to 1 for the regressions.

	Dependent Variable: Log(Market Passengers)		
	(1)	(2)	(3)
MHHI delta	-0.633***	-0.157***	-0.269***
	(0.0628)	(0.0448)	(0.0444)
HHI	-0.486***	-0.605***	-0.657***
	(0.0608)	(0.0365)	(0.0361)
Number of Nonstop Carriers		0.00622	0.00591
		(0.00400)	(0.00402)
Southwest Indicator		0.238***	0.222***
		(0.0238)	(0.0236)
Other LCC Indicator		0.192***	0.202***
		(0.0139)	(0.0136)
Share of Passengers Traveling Connect, Market-Level		-1.373***	-1.386***
		(0.0476)	(0.0479)
Population		0.0917**	0.118**
		(0.0452)	(0.0463)
Income Per Capita		0.00833**	0.00688*
		(0.00389)	(0.00392)
Fraction Institutional Ownership			0.175***
			(0.0200)
Institutional Ownership Concentration			-0.210**
			(0.0882)
Top 5 Holdings as Pct. of Total Institutional Holdings			0.104*
			(0.0537)
Year-Quarter FE	✓	✓	✓
Market FE	✓	✓	✓
Observations	228,890	222,347	222,347
R-squared	0.092	0.396	0.402
Number of Markets	7,391	7,081	7,081

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table VIII: Effect of Common Ownership on Airline Ticket Prices: Panel Regressions Excluding Bankruptcy Periods.

Data are for the period 2001Q4-2002Q2 and 2007Q2-2011Q3. We exclude routes with less than 20 passengers per day on average. For the market-carrier-level regressions, we weight by average passengers for the market carrier over time and cluster standard errors at the market level. For the market-level regressions, we weight by average passengers in the market over time and cluster standard errors at the market level. Variable definitions are provided in the online appendix. While throughout the paper the HHI and MHHI are expressed on a scale of 0 to 10,000, we use a scale of 0 to 1 for the regressions.

	Dependent Variable: Log(Average Fare)					
	Market-carrier level			Market-level		
	(1)	(2)	(3)	(4)	(5)	(6)
MHHI delta	0.226***	0.170***	0.158***	0.299***	0.165***	0.212***
	(0.0301)	(0.0278)	(0.0278)	(0.0283)	(0.0249)	(0.0246)
HHI	0.246***	0.167***	0.164***	0.342***	0.260***	0.279***
	(0.0245)	(0.0239)	(0.0253)	(0.0262)	(0.0206)	(0.0216)
Number of Nonstop Carriers		-0.0172***	-0.0150***		-0.0101***	-0.00910***
		(0.00323)	(0.00324)		(0.00276)	(0.00275)
Southwest Indicator		-0.125***	-0.124***		-0.151***	-0.139***
		(0.0173)	(0.0172)		(0.0160)	(0.0158)
Other LCC Indicator		-0.0474***	-0.0512***		-0.0953***	-0.0999***
		(0.00990)	(0.00981)		(0.00859)	(0.00844)
Share of Passengers Traveling Connect, Market-Level		0.0821***	0.0826***		0.189***	0.194***
		(0.0190)	(0.0192)		(0.0159)	(0.0155)
Share of Passengers Traveling Connect		0.0696***	0.0687***			
		(0.0133)	(0.0133)			
Population		-0.0720**	-0.0851***		0.00119	-0.0276
		(0.0332)	(0.0329)		(0.0279)	(0.0283)
Income Per Capita		0.00383	0.00445*		0.00443**	0.00509**
		(0.00251)	(0.00250)		(0.00203)	(0.00201)
Fraction Institutional Ownership			-0.0285***			-0.126***
			(0.00903)			(0.0121)
Institutional Ownership Concentration			-0.0563**			0.120***
			(0.0278)			(0.0459)
Top 5 Holdings as Pct. of Total Institutional Holdings			0.164***			0.121***
			(0.0178)			(0.0241)
Year-Quarter FE	✓	✓	✓	✓	✓	✓
Market-Carrier FE	✓	✓	✓			
Market FE				✓	✓	✓
Observations	537,406	525,232	525,232	228,890	222,347	222,347
R-squared	0.120	0.163	0.169	0.160	0.263	0.279
Number of Market-Carrier Pairs	45,055	43,786	43,786			
Number of Markets				7,391	7,081	7,081

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table IX: Effect of Common Ownership on Airline Ticket Prices: Using Only Largest 10, 5, 3, and 1 Shareholders.

Data are for the period 2001Q1-2013Q1. We exclude routes with less than 20 passengers per day on average. For the market-carrier-level regressions, we weight by average passengers for the marketcarrier over time and cluster standard errors at the market level. For the market-level regressions, we weight by average passengers in the market over time and cluster standard errors at the market level. We calculate the MHHI delta setting the control rights to zero for shareholders other than the largest 10, largest 5, largest 3, and largest shareholder for each market and date. Variable definitions are provided in the online appendix. While throughout the paper the HHI and MHHI are expressed on a scale of 0 to 10,000, we use a scale of 0 to 1 for the regressions.

	Dependent Variable: Log(Average Fare)							
	Market-carrier level				Market-level			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
MHHI delta (Top 10 Shareholders)	0.130***				0.194***			
	(0.0218)				(0.0229)			
MHHI delta (Top 5 Shareholders)		0.124***				0.170***		
		(0.0194)				(0.0202)		
MHHI delta (Top 3 Shareholders)			0.107***				0.141***	
			(0.0163)				(0.0170)	
MHHI delta (Top 1 Shareholder)				0.0685***				0.0775***
				(0.00968)				(0.00997)
HHI	0.150***	0.148***	0.144***	0.133***	0.271***	0.264***	0.256***	0.238***
	(0.0181)	(0.0181)	(0.0181)	(0.0181)	(0.0214)	(0.0211)	(0.0211)	(0.0209)
Number of Nonstop Carriers	-0.0108***	-0.0108***	-0.0108***	-0.0110***	-0.00918***	-0.00913***	-0.00911***	-0.00944***
	(0.00244)	(0.00244)	(0.00245)	(0.00246)	(0.00275)	(0.00275)	(0.00276)	(0.00278)
Southwest Indicator	-0.117***	-0.117***	-0.118***	-0.118***	-0.139***	-0.140***	-0.141***	-0.141***
	(0.0130)	(0.0130)	(0.0130)	(0.0131)	(0.0158)	(0.0158)	(0.0159)	(0.0160)
Other LCC Indicator	-0.0590***	-0.0594***	-0.0599***	-0.0608***	-0.100***	-0.101***	-0.102***	-0.103***
	(0.00768)	(0.00767)	(0.00766)	(0.00765)	(0.00844)	(0.00844)	(0.00843)	(0.00844)
Share of Passengers Traveling Connect, Market-Level	0.126***	0.126***	0.127***	0.129***	0.194***	0.194***	0.194***	0.196***
	(0.0155)	(0.0155)	(0.0155)	(0.0154)	(0.0155)	(0.0155)	(0.0155)	(0.0156)
Share of Passengers Traveling Connect	0.0701***	0.0700***	0.0696***	0.0685***				
	(0.0107)	(0.0108)	(0.0107)	(0.0107)				
Population	-0.0365	-0.0360	-0.0358	-0.0376	-0.0275	-0.0270	-0.0266	-0.0286
	(0.0290)	(0.0290)	(0.0290)	(0.0291)	(0.0284)	(0.0284)	(0.0285)	(0.0287)
Income Per Capita	0.00470**	0.00469**	0.00472**	0.00468**	0.00501**	0.00499**	0.00502**	0.00491**
	(0.00203)	(0.00203)	(0.00203)	(0.00205)	(0.00202)	(0.00202)	(0.00202)	(0.00204)
Fraction Institutional Ownership	-0.0173***	-0.0173***	-0.0173***	-0.0155***	-0.123***	-0.121***	-0.120***	-0.113***
	(0.00526)	(0.00525)	(0.00526)	(0.00532)	(0.0121)	(0.0121)	(0.0122)	(0.0124)
Institutional Ownership Concentration	0.0469**	0.0459**	0.0422**	0.0395*	0.109**	0.0989**	0.0797*	0.0566
	(0.0218)	(0.0217)	(0.0215)	(0.0215)	(0.0454)	(0.0450)	(0.0445)	(0.0439)
Top 5 Holdings as Pct. of Total Institutional Holdings	0.0471***	0.0466***	0.0473***	0.0493***	0.124***	0.128***	0.135***	0.150***
	(0.0115)	(0.0115)	(0.0115)	(0.0114)	(0.0241)	(0.0241)	(0.0241)	(0.0239)
Observations	1,089,818	1,089,818	1,089,818	1,089,818	222,347	222,347	222,347	222,347
R-squared	0.146	0.146	0.146	0.146	0.278	0.278	0.278	0.276
Number of Market-Carriers	49,057	49,057	49,057	49,057				
Number of Markets					7,081	7,081	7,081	7,081

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1