Anticompetitive Effects Of Common Ownership

José Azar, Martin C. Schmalz, and Isabel Tecu*

*Azar is with IESE Business School (jazar@iese.edu). Schmalz is with the Ross School of Business, University of Michigan, CEPR, and ECGI (schmalz@umich.edu). Tecu is with Charles River Associates (itecu@crai.com). For helpful comments, we thank Cindy Alexander, Susan Athey, Jonathan Berk (discussant), Alon Brav, Severin Borenstein, John Coates, Peter Cramton, Daniel Crane, Vicente Cuñat (discussant), Martino DeStefano, Alex Edmans, Einer Elhauge, Andrew Ellul, Daniel Ferreira (discussant), Todd Gormley, Daniel Greenfield (discussant), Umit Gurun, Charles Hadlock, Johan Hombert, Dirk Jenter, Louis Kaplow, Ryan Kellogg, Han Kim, Kai-Uwe Kühn, Juwon Kwak (discussant), Francine Lafontaine, Maggie Levenstein, Robert Levinson, Evgeny Lyandres (discussant), Gregor Matvos, Holger Müller, Vikram Nanda (discussant), David Reitman, Nancy Rose, Farzad Saidi (discussant), Steven Salop, Sarath Sanga (discussant), Fiona Scott Morton, Michael Roberts (the editor), Amit Seru, Carl Shapiro (discussant), Jesse Shapiro, Matthew Shapiro, Andrei Shleifer, Yossi Spiegel, Jeremy Stein, Scott Stern, Sheridan Titman (discussant), Glen Weyl, Toni Whited, Alminas Zaldokas, anonymous referees, several corporate governance and proxy voting executives, the general counsel, and a board member of various large asset management companies, a pricing manager of a major airline, our colleagues, seminar participants at ASU, Berkeley, Bonn, BC, Charles River Associates, Chicago Booth, Columbia GSB, DICE, FRB of New York, FRB of Governors, Goethe Universität, Harvard, Humboldt Universität, IESE, INSEAD, Köln, Mannheim, McGill, MIT, Stanford, Stockholm, Toulouse School of Economics, Tilburg, U.S. Department of Justice, UV Amsterdam, UBC, University of Michigan, UNC, Western University, Yale, conference audiences at the American Bar Association, EARIE, ESWC, EFA, FTC Microeconomics Conference, IFN (Stockholm), IIOC, LBS Symposium, LSE Adam Smith, LSE Economic Networks and Finance, NBER Corporate Finance, NBER SI Law & Economics, Searle Antitrust Conference, Princeton JRCPP, TAU Finance Conference, Texas Finance Festival, and the Utah Winter Finance Conference, and Oliver Richard for help with the DB1B data. Schmalz is grateful for generous financial support through an NTT Fellowship from the Mitsui Life Financial Center. Bret Herzig, Yichuan Wang, and Eric Wilson provided excellent research assistance. All of the authors have read the *Journal of Finance*'s disclosure policy and have no conflicts of interest to disclose. Charles River Associates had the right to review the article prior to its circulation. The views expressed herein are the views and opinions of the authors and do not reflect or represent the views of other consultants or experts who are affiliated with Charles River Associates, nor do they reflect the views and opinions of Charles River Associates or any of the organizations with which the authors are affiliated.

This article has been accepted for publication and undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process, which may lead to differences between this version and the Version of Record. Please cite this article as doi: 10.1111/jofi.12698

ABSTRACT

Many natural competitors are jointly held by a small set of large institutional investors. In the U.S. airline industry, taking common ownership into account implies increases in market concentration that are 10 times larger than what is "presumed likely to enhance market power" by antitrust authorities. Within-route changes in common ownership concentration robustly correlate with route-level changes in ticket prices, even when we only use variation in ownership due to the combination of two large asset managers. We conclude that a hidden social cost – reduced product market competition – accompanies the private benefits of diversification and good governance.

JEL Classification: L41, L10, G34

Keywords: Competition, Ownership, Diversification, Pricing, Antitrust, Governance, Product Market

A long theoretical literature in industrial organization predicts that partial common ownership of natural competitors by overlapping sets of investors can reduce firms' incentives to compete: the benefits to one firm of competing aggressively – for example, gains in market share – come at the expense of firms that are part of the same investors' portfolio, reducing total portfolio value. Theory thus predicts that common ownership can push product markets toward monopolistic outcomes, and imply a deadweight loss for the economy and adverse consequences for consumers.

Contrasting this theoretical argument, the empirical literature thus far largely assumes that common ownership interests by financial institutions do not matter for firms' objectives and product market outcomes. The question of whether this assumption is warranted has first-order implications for many areas of economics, such as finance, industrial organization,

macroeconomics, and antitrust policy. In this paper we aim to shed light on this question by studying the effect of common ownership on product market outcomes. Specifically, we ask, first, how large are current levels of common ownership, and what are the implications for market concentration measures, and second, do current levels of common ownership adversely affect product market competition?

With respect to the scope of the first question, highly diversified mutual fund families and other institutional investors now hold a high (70% to 80%, ICI (2015)) and increasing share of U.S. publicly traded firms' equity. Because several asset management companies are also extremely large, the same fund family is often the single largest beneficial owner of several firms in an industry, with similarly diversified investors following suit. Table I provides examples.[1] The potential scale of the resulting antitrust problem spans across all industries, geographies, and economies with tradable equity securities.

Table I around here

The second question presents a formidable identification challenge.[2] Correlations between common ownership and price-cost margins across firms or industries do not necessarily have a causal interpretation, as reverse causality or potentially omitted control variables may play

[1] In 2013, BlackRock was the single largest shareholder of one fifth of all American publicly traded firms (see Davis (2013) and December 7, 2013, The rise of BlackRock, *The Economist*, see also Craig, Susanne, May 18, 2013, The giant of shareholders, quietly stirring, *The New York Times*). Fichtner, Heemskerk, and Garcia-Bernardo (2016) calculate that the combined holdings of BlackRock, Vanguard, and State Street make them the largest investor of 88% of all firms in the S&P 500. See Roe (1990), and Elhauge (2015) for a discussion of the legal constraints of such ownership structures.

[2] An obvious problem would exist if one beneficial owner controlled 50% or more of the voting securities of all firms in the industry. An open empirical question is whether N investors that each hold more than $50/N\%$ of votes in all firms, or similar structures, can have similar effects.

a role. To take a step towards addressing these challenges, we focus on the U.S. domestic airline industry as a laboratory. This industry focus is motivated by the fact that high-quality route-level price and quantity data are publicly available, and each route can be considered a separate market. These features allow us to relate common ownership concentration to prices within the same firm, period, and industry, which reduces the amount of confounding variation. Further, using only variation in airline ownership caused by a consolidation event in the asset management industry that is unlikely to be caused by developments in the U.S. airline industry supports a causal interpretation of our results. To alleviate concerns about model misspecification and the endogeneity of market shares, for which we lack an exogenous source of variation, we conduct a variety of placebo tests.

We first calculate measures of market concentration that take into account not only market shares, but also the network of cash flow and control rights that constitute airline shareholders' economic interests. We find that the anticompetitive incentives implied by common ownership concentration alone – which are incremental to those implied by the traditional Herfindahl–Hirschman Index (HHI) market concentration and are measured on the same scale – are more than 10 times larger than what the Federal Trade Commission (FTC)/Department of Justice (DOJ) 2010 horizontal merger guidelines presume "to be likely to enhance market power." They are also 10 times larger than the HHI threshold beyond which the burden of proof shifts from the regulator to the private parties involved 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 facts suggest that it is reasonable to expect an effect of common ownership on product prices.

Next, we test whether these anticompetitive incentives do indeed translate into measurable effects on product market competition. Specifically, we examine whether changes in

common ownership concentration in a given route over time are associated with changes in ticket prices in the same route. For example, theory predicts that the entrance of an independent player (a firm not owned by the same set of investors who own the incumbent airlines) increases competition and reduces prices. By contrast, competition should soften in a route when the owners of incumbent airlines acquire significant ownership and control rights in an independent carrier serving the same route.

Using fixed-effect panel regressions, we find that ticket prices are approximately 3% to 7% higher in the average U.S. airline route than would be the case under separate ownership. This effect of common ownership is similar in magnitude to, and incremental to, the effect of the traditional HHI measure of market concentration, and controls for commonly used covariates. Given the industry's average net profit margin in 2015 was 4% (IATA (2015)), the magnitude of the effect is economically significant. Fixed effects difference out alternative interpretations at the firm, route, firm-route, and firm-time levels, such as confounding effects of fuel or oil price changes. We also find that changes in passenger volume are negatively related to changes in common ownership, which indicates that the price effects are not driven by increased demand that institutional shareholders correctly anticipate (a reverse-causality argument).

We conduct a large number of placebo and robustness tests to examine the empirical validity of concerns regarding functional form, market definition, confounding mergers and bankruptcies, reverse causality, the assumption that control is proportional to the fraction of votes held, and the model of competition. Some of these tests may have direct policy implications. For example, we run a difference-in-differences test based on BlackRock's acquisition of Barclays Global Investors (BGI) in 2009. This identification strategy uses only the 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. Since airline stocks constituted only a small fraction of the merging parties' portfolios, it is unlikely that this variation is driven by expected changes in U.S. airline ticket prices. While estimated using much less variation than the panel regressions, the estimates from this strategy are arguably less affected by endogeneity of ownership and market shares. The results indicate that product prices may be 10% to 12% higher due to common ownership. Multiplying these estimates by the average route-level increase in common ownership due to the consolidation event indicates that the acquisition itself increased average ticket prices by about one-half a percent.

Additional tests help shed light on the corporate governance mechanisms that may translate common owners' incentives to firms' product market strategies. These tests also further help alleviate endogeneity and misspecification concerns. For example, we find that the results are driven by the top-ranked shareholders of a firm as well as by long-term shareholders. The fact that no significant effects obtain when we assume control by shareholders that are unlikely to have control (such as very small and short-term shareholders) is inconsistent with endogeneity of market shares driving the main results. We also document significant effects from both firm- and market-level variation in common ownership over time, and find that the effects are stronger for larger and for more concentrated markets. These findings are consistent with a model of rational attention allocation by investors and airlines to markets where the bottom-line impact of increased prices is greater.

We complement the above analysis with a discussion of anecdotal and empirical evidence on shareholder engagement related to product market strategy using (i) voice, (ii) incentives, and (iii) voting. Not withstanding the evidence presented, however, it is important to recognize that common owners of competitors need not explicitly communicate their anticompet-

itive incentives to management for the documented outcomes to materialize. For instance, not explicitly demanding or incentivizing tougher competition between portfolio firms may allow managers to enjoy the "quiet life" (Hicks (1935), Bertrand and Mullainathan (2003)), and thus lead to an equilibrium with reduced competition and sustained high margins. Indeed, we are not aware of systematic evidence supporting the view that large diversified asset managers actively encourage their portfolio firms to compete more aggressively against each other. (Such behavior would likely violate both the asset managers' and their investors' incentives.) By contrast, concentrated owners such as hedge fund activists have been shown to push their target firms to compete more aggressively against industry rivals. Competitive concerns thus arise when concentrated owners get crowded out by diversified institutions that also hold large stakes in industry rivals — *even if the institutions driving the common ownership links are entirely "passive"* in terms of corporate governance (other than voting).

The paper proceeds as follows. Section I discusses the related literature. Section II develops our hypotheses and Section III describes the data that we use in the empirical analyses presented in Section IV. Section V discusses the institutional setting and potential governance mechanisms that may underly the empirical facts presented. Finally, we conclude by discussing policy implications and directions for research in Section VI.

I. Related Literature

To our knowledge, this paper is the first to empirically identify an effect of common ownership concentration on product prices and to document an effect of consolidation in the asset management industry on portfolio firms' product prices. We thus complement a long but mostly theoretical literature arguing that shareholders with diversified portfolios

seek to maximize joint portfolio profits as opposed to individual firm profits, and as a result large-shareholder diversification can reduce competition in product markets e.g., Rotemberg (1984), Farrell (1985), Gordon (1990), Gordon (2003), Admati, Pfleiderer, and Zechner (1994), Hansen and Lott (1996), Rubin (2006), Margotta (2010), Azar (2012), Azar (2017).

This literature has a rich background. Under imperfect competition, when shareholders hold more than one firm, they may disagree about the firm's objective (see, for example, Hart (1979)). A theory of shareholder preference aggregation is therefore necessary. To that end, Azar (2012, 2017) develop models of oligopoly firm behavior in which competition for shareholder votes among potential managers leads firms to aggregate and internalize shareholder interests, including holdings in competitors.[3]

Reynolds and Snapp (1986) extend classic oligopoly models to allow firms to hold shares in competitors.[4] Bresnahan and Salop (1986) introduce a modified Herfindahl-Hirschman Index (MHHI) to quantify the competitive effects of horizontal joint ventures. We use O'Brien and Salop's (2000) version of the MHHI to measure common ownership concentration.

On the empirical side, Bolle and Güth (1992) calculate the ultimate ownership of natural competitors in the German gas industry and argue that a firm's price setting behavior reflects its shareholders' interests in the firm's competitors. Hansen and Lott (1996) document

[3] Early models of voting on production choices and the internalization of production externalities include Benninga and Muller (1979), DeMarzo (1993), and Crès and Tvede (2005). See also Dekel, Jackson, and Wolinsky (2008), Dekel and Wolinsky (2012), and Casella, Llorente-Saguer, and Palfrey (2012).

[4] See also Bernheim and Whinston (1985), Flath (1991), Flath (1992), Malueg (1992), Nye (1992), Bolle and Güth (1992), Reitman (1994), Parker and Röller (1997), Clayton and Jorgensen (2005), Gilo, Moshe, and Spiegel (2006), Foros, Kind, and Shaffer (2011), Bebchuk, Kraakman, and Triantis (2000), and Nain and Wang (2016).

the extent of common ownership across a selection of competitors by institutional investors. More recently, Davis (2008) suggests that increasing concentration of mutual fund ownership of U.S. firms points to "a new finance capitalism," but focuses on ownership by families of actively managed funds that constitute "relatively transient owners." Networks of common ownership among diversified institutional investors are studied by, for example, Faccio and Lang (2002), Vitali, Glattfelder, and Battiston (2011), and Davis (2013) and have been related to shareholder voting and various firm-level outcomes by Matvos and Ostrovsky (2008), Matvos and Ostrovsky (2010), Harford, Jenter, and Li (2011) and Fichtner, Heemskerk, and Garcia-Bernardo (2016).

In terms of relating common ownership to competition, the paper closest to ours is Azar (2012), who computes measures of common ownership of U.S. stocks over time and finds a positive relation between common ownership and profit margins in cross-industry panel regressions. He concludes that the full ownership structure of a firm, including institutional shareholders with passive portfolio strategies, should be accounted for in the calculation of modified indices of market concentration. Following this work, He and Huang (2017) use trends across industries in a binary common ownership measure and correlate it with firm-level outcomes such as profitability and market share growth. No prior study has examined effects of common ownership concentration on product prices or quantities.

In terms of methodology and setting, our analysis is related to Borenstein (1990), Werden, Joskow, and Johnson (1991), Kim and Singal (1993), Evans and Kessides (1994), Borenstein and Rose (1994), Borenstein and Rose (1995), Peters (2006), Goolsbee and Syverson (2008), Brueckner, Lee, and Singer (2013), Luo (2014) and Kwoka, Hearle, and Alepin (2016), who study the effects of airline mergers and other route characteristics on prices. Our study differs, however, in that we investigate the effects of changes in market concentration due to

changes in the ownership structure of the industry, holding constant the known structural determinants of prices.

We also contribute to the literature on institutional investors' involvement in corporate governance (see Section V). It is well known that "activist" investors induce changes in executive compensation, turnover, and other corporate decisions that may affect product markets (see especially Brav, Jiang, Partnoy, and Thomas (2008) and Brav, Jiang, and Kim (2011)). We note that strategic changes can typically be implemented only with the support of the firms' largest shareholders, which increasingly are institutions traditionally referred to as "passive" investors. Yet, practitioners point out that "having a passive investment strategy has nothing to do with your behavior as an owner."[5] Our paper thus provides evidence for the notion that "the boundary between long-only money managers and activists is starting to blur."[6]

Lastly, our results provide an empirical answer to the question "Do firm boundaries matter?" (Mullainathan and Scharfstein (2001), Atalay, Hortaçsu, and Syverson (2014)). Our results suggest that common ownership links can blur formal firm boundaries.

II. Hypotheses

The above literature in finance and industrial organization predicts that within-industry diversification of influential shareholders can lead to less competition in portfolio firms' product markets. To see why, imagine an industry with two equal-sized firms, A and B.

[5] Scott, Mike, April 6, 2014, Passive investment, active ownership, *Financial Times*

[6] Gelles, David, and Michael de la Merced, September 26, 2014, New alliances in battle for corporate control, *The New York Times*

Suppose A undercuts B's price to attract customers from B and thus gain market share. Depending on the parameters, firm A may benefit from such a move, by selling many more units of a product at an only slightly reduced price. Variations of this logic are the basis for many standard models of competition.

However, A's gain in market share comes at the expense of firm B's market share, and average prices in the market are lower. As a result, the owner of firm B loses more revenue than the owner of firm A gains and thus the sum of A's and B's producer rents falls. This means that an investor holding equal-sized stakes in both A and B would enjoy greater total (i.e., portfolio) profits if the two firms set prices or quantities as if they were two divisions of a monopoly instead of as two independent firms. We therefore expect less competition compared to the standard model, to the extent that shareholders are diversified across natural competitors and portfolio firms act in their diversified shareholders' interest.

This simple intuition is understood to be potentially important not only in the academic literature but also in the popular press. For example, following Berkshire Hathaway's acquisition of major stakes in each of the nation's largest four airlines, CNBC's Becky Quick asks "You know, Warren, it does occur to me, though, if you're building up such a significant stake in all the major players, is that anything that's, like, monopolistic behavior? Is there any concern to think that you would say something to the airlines to make them make sure that they're not competing [...] quite the same? What would keep somebody from worrying about that?"[7]

[7] Quick, Becky, February 27, 2017, Buffett's Berkshire takes stakes in four major airlines, *CNBC* http://www.cnbc.com/2017/02/27/billionaire-investor-warren-buffett-speaks-with-cnbcs-becky-quick-on-squawk-box.html. We discuss evidence of various types of shareholders making demands to soften competition in Section V.

To empirically investigate whether common ownership of competitors leads to higher product prices, we need a measure that captures the extent to which firms' most powerful owners are also owners of natural competitors. One such measure is the MHHI, originally developed by Bresnahan and Salop (1986) and updated by O'Brien and Salop (2000), which is used by regulators worldwide to assess the competitive risks of holdings of a firm's stock by direct competitors. (Regulators usually ignore beneficial ownership by financial investors; by contrast, we calculate MHHIs taking into account all beneficial owners of a firm's shares, which in most cases are industry outsiders.)

One attractive property of the MHHI is that it allows one to decompose total market concentration (MHHI) into two parts, industry concentration as measured by HHI, $\sum_j s_j^2$, where s_j is the market share of firm j, and common ownership concentration, referred to as

That said, recalling Table I, it seems reasonable to assume that Wells Fargo's top managers understand even without explicit communication with either shareholders or competitors' managers that it is not in his largest shareholders' best interest to compete aggressively for market share against Bank of America. After all, Berkshire Hathaway, Wells Fargo's largest shareholder, famously acquired a multibillion dollar ownership stake in Bank of America during the financial crisis. We feel assured that not only Bank of America's, but also JPMorgan's, management is well informed of these interests, given regular interactions between JPMorgan's top management and its largest shareholders on corporate governance topics (e.g. Foley, Stephen and Ben McLannahan, February 1, 2016, Top U.S. financial groups hold secret summits on long-termism, *Financial Times*) and given the fact that Berkshire Hathaway's Co-CIO is a JPMorgan director (Buhayar, Noah, September 20, 2016, Buffett's investing deputy Combs named to JPMorgan's board, *Bloomberg*). We find it equally likely that top management of the largest airlines in the U.S. also learned about major shifts in the ownership structure of the industry even without being personally informed by Warren Buffett.

MHHI delta. HHI captures the number and relative size of competitors while MHHI delta captures the extent to which those competitors are connected by common ownership and control links. Formally,

$$\underbrace{\sum_j \sum_k s_j s_k \frac{\sum_i \gamma_{ij}\beta_{ik}}{\sum_i \gamma_{ij}\beta_{ij}}}_{\text{MHHI}} = \underbrace{\sum_j s_j^2}_{HHI} + \underbrace{\sum_j \sum_{k \neq j} s_j s_k \frac{\sum_i \gamma_{ij}\beta_{ik}}{\sum_i \gamma_{ij}\beta_{ij}}}_{\text{MHHI delta}}, \tag{1}$$

where β_{ij} is the ownership share of firm j accruing to shareholder i, γ_{ij} is the control share of firm j exercised by shareholder i, and k indexes firm j's competitors.

Another attractive feature of the MHHI is that it can be interpreted in the context of a Cournot model of competition. As we explain in Internet Appendix[8] Section I this helps inform interpretation of our empirical results and clarify potential sources of endogeneity. However, we do not estimate the model. Rather, we use MHHI delta as a reduced-form measure of the decrease in incentives to compete due to common ownership.

The empirical question that we address is whether common ownership concentration as measured by MHHI delta has explanatory power for airline ticket prices after controlling for market concentration as traditionally measured (by HHI) and other known determinants of prices. If MHHI delta does not capture an important part of shareholder incentives, or if governance or informational frictions prevent the implementation of shareholders' anticompetitive incentives, empirical tests should support the null hypothesis.

H0: *Common ownership concentration, as measured by MHHI delta, has no effect on ticket prices.*

[8] The Internet Appendix is available in the online version of this article on the *Journal of Finance* website.

If, on the other hand, economic incentives, as captured by MHHI delta, explain economic outcomes at least in part, the alternative hypothesis should find support.

H1: *Common ownership by diversified investors, as measured by MHHI delta, has a positive effect on ticket prices.*

We test these hypotheses using various methods to calculate MHHI delta, some of which relax the "proportional control" assumption, which holds that effective control is proportional to the fraction of control rights held. We also conduct tests in which the measure of common ownership concentration can be interpreted in the context of a Bertrand model of competition.

III. Data

A. Data on Ticket Prices and Market Shares

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 10% of airline tickets each quarter over the period 2001Q1 to 2014Q4. Following the literature, the markets that we consider in our baseline specifications are origin-destination airport pairs in the U.S., regardless of direction. 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.[9] We limit our analysis to markets with an average of at least 20 passengers a day. We describe

[9] We thus abstract from frictions associated with imperfect vertical integration (Forbes and Lederman (2009, 2010)). Relatedly, alliances other than direct affiliations are typically between domestic and

other filters (to screen out tickets that cannot be readily assigned to a particular market, that contain unreliable information, etc.) in the Internet Appendix, along with the key variables. We retain over one million observations at the carrier-market-quarter level.

Table II reports 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 $219. The average number of passengers per quarter is 3,930 per carrier market and 18,429 per market. Average HHI calculated based on passenger shares of ticketing carriers, is about 5,300 across markets and over time. On average, around two-thirds of passengers in a given market use connecting flights, and sample markets contain 0.73 nonstop carriers. Southwest competes nonstop in 9% of the markets, and other low-cost carriers (LCCs) compete nonstop in 8% of the markets. For each market in our sample, we follow prior airline literature (see, for example, Brueckner, Lee, and Singer (2013)) and use data from the Bureau of Economic Analysis to calculate the geometric mean of population and income per capita across the metro areas at the endpoints. The average "market population" is 2.3 million and the average "market income" is approximately $42,000.

Table II around here

B. *Data on Airline Ownership*

To construct the common ownership network of each market-year-quarter, we start with institutional holdings from the Thomson-Reuters Spectrum dataset that comes from 13F filings. These data include all U.S. holdings of publicly traded firms by institutional investors that manage more than $100 million as well as information on the number of shares

foreign carriers, not between domestic carriers (Brueckner and Whalen (2000)).

that are voting shares.[10] Holdings are not observed during bankruptcy periods. During the bankruptcies of American Airlines, Delta Airlines, Northwest Airlines, United Airlines, and US Airways, we repeat the last observed value for percentage of shares owned; we offer detailed robustness and placebo results by varying the treatment of bankruptcy events. We complement the institutional ownership data with hand-collected noninstitutional ownership from proxy statements, available from the SEC's website, for owners that hold at least 5% of outstanding shares in any company in our sample.

To shed light on the extent of common ownership in the current U.S. airline industry, we list the top-10 shareholders and their ownership percentage as of the fourth quarter of 2016 for a sample of airlines in Table I. Note that American Airlines' top-seven shareholders (who jointly control 49.55% of the stock) are also among the top-10 investors of Southwest Airlines and various other competitors. Similarly, each of Southwest's top-six shareholders is among the top-10 shareholders of American and Delta, and five of them are among the top-10 holders of United as well. By contrast, an individual who owns 20.30% of Allegiant Air is the airline's largest shareholder but does not appear among the largest holders of any of the other airlines. We use such cross-sectional variation in airline ownership and its changes over time as a source of variation in market-level competitor ownership networks.

[10] The Thomson-Reuters dataset is known to be incomplete and feature various inaccuracies. To improve its accuracy, we combine holdings from separate filings by the same asset manager, and add missing filings that we obtain from the SEC's website for BlackRock in 2010 and 2013 to 2015, Barclays in 2003Q4, Northern Trust in 2014Q1, BNY Mellon in 2013Q3, and JPMorgan in 2003Q4, 2008Q3, 2013Q3-Q4.

C. *Quantifying Economic Incentives Using MHHI*

Table I gives a sense of the degree to which industry competitors are commonly owned, but does not quantify common ownership concentration. To do so, we calculate the control share of shareholder i in firm j, γ_{ij}, as the percentage of the sole and shared voting shares of firm j held by shareholder i. Similarly, we calculate the ownership share of investor i in firm j, β_{ij}, as the percentage of all shares (voting and nonvoting) of firm j held by shareholder i. We disregard shareholdings with voting and nonvoting shares of less than 0.5%. This filter amounts to assuming that institutions with less than 0.5% ownership of the firm have no weight in the firm's objective function; we consider variations of this assumption below. With respect to the definition of "shareholder," we aggregate holdings at the fund family level to match the institutional feature of voting and governance at the family level, as well as fund families' incentives, which – consistent with the incentives of their investors – are determined primarily by the value of their total assets under management.[11] (The family's incentives must not be confused with the incentives of an individual fund manager within the family, which are often tied to outperforming a benchmark or tracking an index).[12]

We calculate MHHI delta (the density of the ownership network) for each route quarter

[11] Although some evidence exists of coordination of governance activities across fund families, we do not empirically study the possibility of blockholders forming coalitions as suggested by Zwiebel (1995) because we have no hard data on such behavior. Interviews with proxy managers indicate that antitrust concerns prevent them from discussing proxy voting with other investors at a high frequency.

[12] One may thus wonder why fund managers rescind their votes to an office that may vote the shares different from their fund's interest. There are two reasons. First, it is well known that cross-fund subsidization is in the interest of their families (Gaspar, Massa, and Matos (2006)). Second, coordinating corporate governance activities at the family level can be consistent with fulfilling the fund manager's

between 2001Q1 and 2014Q4. Figure 1 shows the average MHHI and average HHI across routes over that period; the difference (MHHI delta) is the part of market concentration that is due to common ownership. Despite various mergers, market-level HHI is quite stable over time. By contrast, the average MHHI delta was around 1,400 at the beginning of the period, declined to approximately 1,000 in 2006 to 2007, and then increased to about 2,500 in 2014. Weighting by average passengers in the market over time, the average MHHI delta in 2014 is 2,044. The stark increase in MHHI delta in 2009 coincides with BlackRock's acquisition of Barclays Global Investors that we will use in one of our identification strategies.

Figure 1 around here

To put these numbers in perspective, the DOJ/FTC 2010 Horizontal Merger Guidelines state that in highly concentrated markets (that is, markets with an HHI greater than 2,500), mergers involving changes in HHI of more than 200 points are "presumed likely to enhance market power." Thus, the average MHHI delta in the airline industry due to common ownership in 2014Q4 implies increases in concentration that are more than 10 times higher than the threshold that raises antitrust concerns, if one applies the guidelines to MHHI. This threshold also marks the point beyond which, if two parties intended to merge, the burden of proof that the merger does not lead to enhanced market power shifts to the merging parties (as opposed to the regulator). Hence, if the regulator were to apply this logic in changes of market concentration that are due to common ownership, asset managers would have to prove that the common ownership links that their holdings or acquisitions create do not

fiduciary duty toward individual investors as the equilibrium outcome can benefit all investors compared to the alternative of disaggregated voting, even if each individual owner would choose a slightly different policy. This can be true for both cost degression and strategic reasons. The strategic interpretation is that the asset manager serves a coordinating role, similar to the role of some voting trusts a century ago. Individual investors appear content to give up voting rights to the fund manager for similar reasons.

affect market prices.

Figure 1 also provides histograms of the distribution of MHHI delta across routes in 2001Q1 and 2014Q4. Across the full sample, about 5% of routes have an MHHI delta of close to zero – that is, have no common ownership. That is the case when only one carrier serves the route, when the route is served by multiple carriers that do not share common owners. For example, JetBlue was not publicly traded in 2001, went public in 2002, and became owned by investors similar to those of the legacy carriers thereafter. Thus, some routes served by JetBlue may be part of the zero-MHHI delta group in 2001 but part of the positive-MHHI delta group after the IPO. In the 2014Q4 distribution, the 10th percentile is at 109 HHI points, the 25th at 1,421, the median at 2,684, the 75th at 3,642, and the 90th percentile is at 4,184 HHI points. On average common ownership increases concentration by about as much as going from four equal-sized carriers to two equal-sized carriers. The correlation between MHHI delta and HHI is -0.69. The correlation between MHHI and HHI is 0.87.

In sum, the incentives for anticompetitive behavior implied by current levels of common ownership, as measured by MHHI delta, are an order of magnitude larger than those for market power recognized by conventional measures that are measured on the same scale. We examine whether firms implement these incentives in the following section.

IV. Empirical Methodology and Results

A. Panel Regressions of Product Prices on Common Ownership

Figure IA.1 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 this raw correlation. Many factors could impact differences in airfares across markets that may also be correlated with common ownership in a given market. In our baseline analysis we address various such omitted variable concerns with explicit controls and fixed effects.

A.1. Panel Regression Methodology

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

$$\log(p_{rjt}) = \beta \cdot MHHI\ delta_{rt} + \gamma \cdot HHI_{rt} + \theta \cdot X_{rjt} + \alpha_t + \nu_{rj} + \varepsilon_{rjt}, \tag{2}$$

where p_{rjt} is the average price of carrier j in route r at time t, $MHHI\ delta_{rt}$ is the MHHI delta for route r at time t (it is the difference between MHHI and HHI – *not* the time variation in MHHI), X_{rjt} is a vector of controls, α_t are time fixed effects (at the quarterly frequency), and ν_{rj} are market $\times$ carrier fixed effects. Following Goolsbee and Syverson (2008), we weight the market-carrier-level regressions by the average number of passengers of the market and carrier over time. We double-cluster standard errors by market-carrier and year-quarter. Additionally, we run regressions aggregated at the market level:

$$\log(p_{rt}) = \beta \cdot MHHI\ delta_{rt} + \gamma \cdot HHI_{rt} + \theta \cdot X_{rt} + \alpha_t + \nu_r + \varepsilon_{rt}, \tag{3}$$

where p_{it} is the average price of route i at time t. We consider alternative specifications below. In the market-level regressions we weight by the average number of passengers of the

market and double-cluster standard errors by market and year-quarter.

As controls, we include the log of distance interacted with year-quarter fixed effects to control for the price effect of changes in oil or fuel prices that may differentially affect routes of different length in ways that could be correlated with common ownership. We also include various market characteristics that HHI fails to capture: the number of nonstop carriers operating in a route, an indicator for whether Southwest operates nonstop in a route, an indicator for whether another LCC operates in a route, the log of the geometric average of the population in the two endpoints of a route, the log of the geometric average of per capita income in the two endpoints of 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).

When interpreting the coefficient on MHHI delta (β), one should keep mind that market shares (which enter both MHHI delta and HHI) are potentially endogenous in ways that are likely to negatively bias this coefficient. An investor with holdings only in one airline should increase her stake if she correctly (and before the rest of the market) anticipates an increase in firm profitability. Such purchases decrease MHHI delta, which leads to a negative relation between MHHI delta and future price-cost margins. If this theory is correct, an instrumented version of the above regression should produce higher estimates of β. The bias could also go in the other direction. This would be the case if passive investors' portfolios anticipated demand shifts in particular airlines' routes more so than active investors did, and as a result bought shares in multiple airlines flying these routes, which would lead to an endogenously positive relation between MHHI delta and ticket prices. This seems implausible. However, such variation could be implemented by active investors picking industries rather than stocks. To shed light on the direction of the bias, we compare estimates across panel

and instrumented regressions and find support for negative bias in the baseline regressions. We also find in several placebo tests that variation in MHHI delta driven by changes in ownership by shareholders with little effective control does not correlate with price changes. This finding is inconsistent with the hypothesis that endogeneity of market shares drives our main results.

A.2. Panel Regression Results

Results from our basic regression in equation (2) are reported in Table III. In each specification we find a large and significant positive effect of MHHI delta on average fares. The coefficient of 0.194 in the first specification with only time and market-carrier fixed effects implies that an increase in MHHI delta from zero to 2,000 (approximately the weighted average level of MHHI delta in 2014Q4) is associated with an increase in average fare of 4%. Similarly, going from the 25th to 75th percentile increases prices by 4.3%, and going from the 10th to 90th percentile indicates an increase in fares of 8.2%.

Table III around here

In specification (2), we account for the differential effect that changes in jet-fuel prices may have on operating costs in routes of different lengths by controlling for the log of distance interacted with year-quarter fixed effects. Doing so leads to slightly higher coefficients on both HHI and MHHI delta. In specification (3), we add controls for market characteristics. The coefficients on HHI and MHHI delta remain positive and both statistically and economically significant, albeit slightly attenuated relative to the first specification. The coefficients on the control variables have the expected signs: a larger number of nonstop competitors, Southwest's nonstop presence and other LCCs' nonstop presence are all associated with lower fares.

Specifications (4) to (6) are analogous to specifications (1) to (3) but aggregated at the

market level instead of the market-carrier level. We find qualitatively similar results, but the coefficients on MHHI delta and HHI are higher. One possible reason is that specifications (4) to (6) do 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, in the market-carrier-level regressions, the large number of fixed effects exacerbates measurement error and therefore leads to more severe attenuation bias.

A.3. Robustness of the Baseline Analysis

Given that the airline industry experienced significant changes over time, in a first robustness test we examine whether the effect of MHHI delta has a similar magnitude over time by interacting both MHHI delta and HHI with year dummies. Figure IA.2 plots the coefficients for the market-level specification with controls. The effect of MHHI delta on fares is positive and statistically significant in most years, and similar in magnitude across all years, but the effect of MHHI delta is slightly more volatile. The coefficient on MHHI delta is insignificant in 2006 and 2007, possibly because both Delta Air Lines and Northwest were in bankruptcy during this time. Bankruptcies may confound the results because shareholders have no de jure control rights during such times, and this feature is not captured in our computation of MHHI delta.

To more directly investigate the impact of bankruptcies on our estimates, in Table IV, specification (1), we exclude from the sample quarters in which one of the major airlines was in bankruptcy, which leaves us with the periods 2001Q1–2002Q2, 2007Q2–2011Q3, and 2014Q1–2014Q4. The estimates are similar to those in the main specification. Specification (1) in Table IA.I further shows that if we sample only market-carriers in bankruptcy, there

Table IV around here

is no effect of MHHI delta (but also no effect of HHI, maybe because of the reduced sample size). The subsequent specifications in the table show that the effect of MHHI delta is similar to that in the baseline in markets not affected by bankruptcies, and is significant in both bankruptcy markets and nonbankruptcy markets (though the effects of MHHI delta and HHI are higher in the latter). The bottom line is that the results are generally weaker in markets and at times affected by bankruptcies, consistent with shareholders not being in control during such times. We conclude that the baseline results are not driven by an unusual sample subperiod in general or by bankruptcies in particular.

We also check robustness to adding institutional ownership and institutional ownership concentration controls. Following Hartzell and Starks (2003), we 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 held by the top five institutional owners in the firm. For the market-level regressions, we calculate the passenger-weighted average of the institutional ownership variables. The results are similar, as shown in Table IV, specification (2). The table also checks robustness to various other concerns. For example, city pairs may constitute a better basis for defining a market than airport pairs. Table IV, specification (3), shows that the results are similar, and indeed somewhat stronger. Also, the functional form assumed by equation (2) is unlikely to drive the results: controlling for a tenth-order polynomial in HHI does not significantly change the coefficient on MHHI delta (specification (4)).

A.4. Limitations of the Baseline Analysis

An attractive feature of the analysis so far is that a large number of potentially omitted variables is differenced out via fixed effects. For example, because we employ carrier-route

fixed effects, market power on specific routes due to frequent-flyer programs (Lederman (2007)) is differenced out. Nevertheless, several other significant limitations remain, including potential endogeneity of market share and ownership as well as various forms of model misspecification. We first address reverse causality, that is the possibility that ownership changes could be driven by price changes rather than the other way around. Next, we consider alternative approaches to computing MHHI delta. Most importantly, we relax the proportional control assumption. In doing so, we not only ensure robustness, but also obtain insights into which shareholders drive the results as well as the corporate governance mechanisms that appear to be at play. These variations also yield important placebo tests: when MHHI delta is computed using ownership stakes of shareholders that are not expected to exert control on firm strategy, MHHI delta should have no effect on prices unless endogeneity of market shares or other misspecifications drive the results. We also consider alternative specifications that can be more easily interpreted in the context of a Bertrand model of competition. We show that controlling for multi-market contact does not significantly impact the effect of common ownership concentration.

B. Reverse Causality Concerns

We employ three sets of tests to examine – and reject – the hypothesis that the baseline results are due to changes in ticket pricing causing changes in common ownership, market share, or both, rather than the other way around. We begin by using distributed-lag regressions. We then use difference-in-differences (DiD) and an IV strategy that relies on a large consolidation event in the asset management industry as a quasi-exogenous shock to common ownership concentration. We close with panel regressions that use passenger volume as the outcome variable instead of ticket prices.

B.1. Panel Regressions with Leads and Lags of MHHI delta and HHI

If increased common ownership concentration causes higher prices, but higher prices do not cause increased common ownership concentration, one would expect increases in common ownership concentration to precede price increases – one would not expect higher common ownership concentration to follow price increases. To test these hypotheses against each other, we implement dynamic panel regressions that include leads and lags of MHHI delta. Table V shows that the coefficients on lags of MHHI delta are correlated with prices, whereas the coefficients on leads of MHHI delta are not significantly different from zero. The former result reduces the likelihood of reverse causality, and is consistent with the institutional feature that most airlines pre-commit capacity to routes months in advance. The latter (non-)result constitutes a first successful placebo test. Note also that the coefficient on lagged MHHI delta is very similar in magnitude to the baseline estimate.

Table V around here

However, theoretically there remains a possibility that some investors are well informed about route-level demand changes several months before the fact but cannot determine which airline serving the route will benefit more, and therefore buy shares of all airlines with high market shares in those routes, thus driving the association between lagged MHHI delta and current prices. To test this hypothesis, we would ideally re-assign common ownership densities across routes in a way that has no obvious link to future changes in demand or in airlines' pricing strategies. An event that took place in the asset management industry in 2009 affords us a setting that comes close to such an ideal experiment. We analyze this event next.

B.2. Variation due to the BlackRock-BGI Acquisition

Background on BlackRock's Acquisition of Barclays Global Investors

Following the financial crisis that began in 2007, Barclays tried to strengthen its balance sheet. On March 16, 2009, Barclays received a $4 billion bid from CVC Capital Partners for its iShares family of exchange-traded funds, along with an option to solicit competing offers. BlackRock announced a bid to acquire iShares' parent division, Barclays Global Investors (BGI), for $13.5 billion on June 11, 2009 (i.e., in 2009Q2). The bid was successful and the acquisition was formally completed in December 2009.

The history of Barclays' attempt to sell iShares to investors other than BlackRock suggests the divestment decision was not driven primarily by considerations regarding how the iShares portfolio would combine with BlackRock's portfolio in terms of potential product market effects. Moreover, U.S. airline stocks comprised only a small share of BGI's portfolio and thus it is unlikely that airlines were pivotal to BlackRock's decision to acquire BGI, much less route-level variation in expected ticket price changes, which alleviates reverse causality concerns. More formally, the exclusion restriction is that the cross-sectional distribution across U.S. airlines routes in the implied increase in common ownership from a hypothetical, pre-merger combination of BlackRock and BGI's equity portfolios is uncorrelated with errors in the ticket price regression, conditional on controls. This assumption could fail, for example, if we systematically mismeasured economic conditions at departure and destination points in ways that begin to correlate after the acquisition with the increase in common ownership concentration implied by a hypothetical combination of pre-announcement airline stakes of BlackRock and BGI. While we are not aware of a particular reason to expect such a correlation, such a possibility remains a limitation of our analysis.

Notwithstanding the fact that airlines constituted only a small part of the merging parties' portfolios, both Barclays and BlackRock were among the largest owners of some airlines but not others. For example, Barclays was the fifth-largest and BlackRock was the 17th-largest

shareholder of Airtran Airways in 2009Q1, but a hypothetically combined BlackRock-BGI entity would have been the second-largest shareholder of the firm in 2009Q1, and hence much more powerful. By contrast, BGI also held a large stake in American Airlines before the merger but BlackRock did not. As a result, merging BlackRock and BGIs' equity portfolios had no effect on American's ownership structure. The variation across portfolio firms in the degree to which the BlackRock-BGI changed their ownership structure translates into variation across airline routes, because different combinations of airlines compete in different routes.

Difference-in-Differences Design

We exploit the variation in common ownership concentration across markets generated by BlackRock's acquisition of Barclays BGI as follows. We start by calculating 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 and market with the only difference being that we treat the holdings of BlackRock and Barclays as if they were already held by a single entity. We call the difference between the latter and former MHHI deltas the "implied change in MHHI delta." The null hypothesis is that the acquisition had no effect on portfolio firms' product market behavior. The alternative hypothesis is that markets more affected by the acquisition – those with a higher implied change in MHHI delta – experienced price increases relative to less affected markets.

Figure IA.3 shows the distribution of the implied change in MHHI delta across routes. Markets in the top tercile are the treatment group, and markets in the bottom tercile are the control group. The mean and median of the implied change across routes is 91 HHI points, the implied change is larger than 100 HHI points in more than 2,000 routes, and the largest

implied increase is 281 HHI points. These are nontrivial changes in market concentration, and thus changes for which we can reasonably expect to find increases in market prices. The DOJ/FTC Horizontal Merger Guidelines 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."

We next estimate the following DiD specification, interacting the treatment dummy and controls with year-quarter fixed effects, for all periods between 2006Q2 (12 quarters before the announcement) and 2014Q4:

$$\log\left(p_{rjt}\right) = \sum_{k=-n_{\text{pre}}}^{n_{\text{post}}} \delta_{DiD}^{k} \cdot Treat_{r}^{k} + \sum_{k=-n_{\text{pre}}}^{n_{\text{post}}} \gamma_{DiD}^{k} \cdot X_{rj}^{k} + \alpha_{t} + \nu_{rj} + \varepsilon_{rjt}, \tag{4}$$

where $Treat_{j}^{k}$ is the interaction between the treatment dummy and year-quarter fixed effects, that is, a dummy equal to one for treated firms in period k and zero otherwise. Similarly, X_{j}^{k} is the interaction between pre-period control variables and year-quarter fixed effects. We drop the interactions with 2008Q4, which serves as the base period, and thus the estimated δ_{DiD}^{k} coefficients represent the change in the difference between treatment and control markets between 2008Q4 and the given period.

Various potentially confounding events occurred around this period, including several mergers, a bankruptcy, and the Great Recession. First, the Delta-Northwest merger was announced in April 2008 and became effective in September 2008. Similarly, the United-Continental merger was announced in May 2010 and became effective in October 2010, the Southwest-Airtran merger was announced in September 2010 and became effective in March 2012, and the American-US Airways merger was announced in February 2013 and became effective in November 2013. These mergers may have directly affected markets that had

a sizable share of both merging partners. If these effects were for some reason correlated with the way common ownership concentration increases as a result of the BlackRock-BGI acquisition, the DiD coefficients could be biased. To determine whether this concern is likely to be empirically important, we capture the extent to which a route was affected by each merger by computing the implied increase in HHI in each route in the quarter before the merger for the Delta-Northwest merger and in 2009Q1 for the others (since these happened after the BGI acquisition, we need to use 2009Q1 instead of the pre-merger quarter to avoid using the post-period in the calculation of the control variables). We add these implied HHI deltas interacted with year-quarter fixed effects as controls. In addition, American Airlines filed for bankruptcy in November 2011. We control for American's share in a market in 2009Q1 interacted with year-quarter fixed effects to account for any direct effect of this event. Lastly, the U.S. economy was emerging from recession around the time of the BGI acquisition. We capture the exposure of a route to the recession as the change in log per capita income between the start of the Great Recession in 2007Q3 and 2009Q1, and add this measure interacted with year-quarter fixed effects as a control as well.

The results are reported in Figure 2. While the difference between the treatment and control fluctuates around zero somewhat during the pre-period, the overall trend before the announcement is flat. The trend changes after the announcement of the acquisition, and the coefficients are significantly positive for most periods after the completion of the acquisition. Thus, the sign of the effect, based on variation in common ownership generated by the BGI acquisition, is consistent with our previous results from the panel regressions.

Figure 2 around here

IV Design

In this subsection we complement the DiD analysis above with an IV strategy to obtain a

quantitative estimate of the effect of the MHHI delta on prices from the variation generated by the event study. As the pre-period, we use the first quarter before the announcement, 2009Q1. We use 2010Q1, 2011Q1, 2012Q1, 2013Q1, and 2014Q1 as the post-periods (we follow the literature and use the same quarter as the pre-period to rule out seasonality effects), as well as the average of these five quarters. We run specifications with the change in log average fares between the period of interest and 2009Q1 as the dependent variable, and the change in MHHI delta between 2009Q1 and the post-period as the main explanatory variable, controlling for market and carrier characteristics evaluated in 2009Q1. We include all of the control variables used in the baseline specification:

$$\Delta_{\text{2009Q1-Post}} \log(p_{rj}) = \delta_{IV} \cdot \Delta_{\text{2009Q1-Post}} \text{MHHI delta}_r + X_{rj,\text{2009Q1}} + \varepsilon_{rj}. \tag{5}$$

In a continuous-treatment version, we instrument using the raw implied change in MHHI delta, which serves as a continuous treatment variable. In a discrete-treatment version, we instrument the actual change in MHHI delta between the pre- and post-period with the treatment dummy constructed using the top and bottom terciles of the implied change in MHHI delta, as in the DiD analysis above. The relative benefits of the discrete-treatment specification are that it may mitigate concerns related to measurement error and it is easier to understand and depict graphically; the benefit of the continuous-treatment version is that it makes use of more variation. We use heteroskedasticity-robust standard errors. (After taking differences, the above are just cross-sectional regressions).

Table IA.II presents the first-stage regressions of MHHI delta on the discrete treatment instrument and several control variables. MHHI delta, either the discrete or continuous version, is a strong instrument for the actual change in MHHI delta. Specifically, the F-statistics

from weak identification tests range from 57 to 324. (As one would expect, the largest values obtain for 2010Q1, right after the acquisition.) Table VI reports the second-stage results using the continuous treatment. We find a positive and economically sizable but statistically insignificant effect of the change in MHHI delta on the change in log average airfares in 2010Q1, 2011Q1, and 2013Q1, and positive and statistically significant coefficients for 2012Q1 and 2014Q1. The effect for the average of the four periods is positive and highly statistically significant, with a coefficient of 0.466, which is markedly higher than the effects estimated in panel regressions. Table IA.III shows similar results using the discrete treatment variable as an instrument. The estimated effect using the post-period from 2010 to 2014Q1 is 0.462. Multiplying the estimates by the average MHHI delta across routes would imply that ticket prices are about 10% to 12% higher because of common ownership alone, compared to a counterfactual world in which firms are separately owned or in which firms ignore the anticompetitive incentives of their shareholders. As an alternative gauge of economic significance, note that the average implied MHHI delta is about 91 HHI points. Our estimates thus indicate that ticket prices on the average U.S. airline route increased by about 0.5% as a direct result of the BlackRock-BGI acquisition.

Table VI around here

B.3. Effect of Common Ownership Concentration on Passenger Volume

We now provide our fourth – and perhaps simplest – response to the concern that the baseline results could be driven by reverse causality, that is, that some investors correctly anticipate demand changes in specific airline routes and buy stakes in various carriers with high exposure to precisely those routes. Under this "anticipated demand" hypothesis, there should be a positive correlation not only between MHHI delta and prices, but also between MHHI delta and passenger volume. By contrast, if the previously documented price effects

are caused by reduced supply due to higher common ownership concentration, MHHI delta should correlate negatively with passenger volume.

Table IA.V, specification (1), reports results for regressions of passenger volume on common ownership, HHI, year-quarter fixed effects, and market fixed effects. Specification (2) adds additional market structure controls, and specification (3) includes all of the controls used in the saturated price regressions. In all specifications, both HHI and MHHI delta have a negative and significant effect on market passengers, although the magnitude of the coefficients is less stable across specifications than in the price regressions. The coefficient on HHI ranges from -0.496 to -0.583, whereas the coefficient on MHHI delta ranges from -0.665 to -0.213 in the most saturated specification. Using the weighted-average MHHI delta of 2,044 in 2014Q4 to gauge economic significance, the coefficient of around -0.2 from the most saturated specification indicates that the average route has approximately 4% fewer market passengers than there would be under separate ownership.

These results enable us to conduct an additional consistency check. Dividing the coefficient from the quantity regressions' specification (1), -0.665, by the coefficient from the price regressions' specification (4), 0.325, implies an elasticity of demand in the average route of -2.05. Using specifications (2) and (5) from the quantity and price regressions, respectively, the implied elasticity is -1.95. Specifications (3) and (6) imply an elasticity of -1.05. This range of estimates is similar to that reported in the existing literature (-1.37 to -2.01 in Berry and Jia (2010), and -1.4 in IATA (2008)).

These results indicate that increasing demand and reverse causality are unlikely to be driving the price effects. Instead, the results are consistent with increased market power. In addition, the findings suggest why the anticompetitive effects of common ownership have welfare implications: the deadweight loss to the economy comes from the reduced output

that accompanies higher consumer prices.

C. *Relaxing the Proportional Control Assumption*

C.1. *Effect of Common Ownership by Shareholder Rank*

We now turn to robustness checks that are also informative about the potential corporate governance mechanisms that implement the anticompetitive shareholder incentives. In the baseline specifications reported previously, we calculate MHHI delta using all shareholders larger than 0.5%, assuming that smaller shareholders have no significant say in corporate strategy. Consistent with this idea, including all shareholders present in the Thomson database has a minimal effect on the estimated coefficients. To further explore this idea, we now estimate specifications that assume control, for a given carrier and quarter, by only the largest 10, largest five, largest three, and single largest shareholder in the calculation of MHHI delta. These specifications assign zero control to all shareholders outside the top N, but accords ownership rights to all shareholders. Table IA.VI presents the results. Generally speaking, disregarding control rights by shareholders below the top five only slightly attenuates the point estimate, but does not affect statistical significance: the top-five regression yields a coefficient on MHHI delta of 0.136 in the market-carrier specification and 0.173 in the market-level specification. Accounting for the control rights of only the largest shareholder attenuates the point estimate even more with the coefficient equal to 0.0717 in the market-carrier specification and 0.0889 in the market-level specification; both coefficients are significant at the 1% level.

As a complement to the top-shareholder analysis, we run a placebo test in which we do the opposite and calculate MHHI delta as if only shareholders ranked below the top 10

controlled the firm. That is, for each carrier and period, we assign zero control to the top 10 shareholders and then recalculate the MHHI deltas accordingly. If the previous results were driven by a mechanical relationship between MHHI delta and prices, by the increase in institutional ownership in general, by nonlinearities in the way MHHI delta is calculated, or by the endogeneity of market shares, then one should still find a positive and significant effect when using lower-ranked shareholders of each firm instead of the top shareholders. Instead, as shown in Table IA.VII, we find that MHHI deltas calculated in this way have no significant effect on ticket prices.

To get a sense of how quickly the estimated effect declines as we consider lower-ranked shareholders, we run specifications using MHHI deltas calculated as if complete control of the firm were given to shareholders of a particular rank in each firm-year-quarter. That is, we assign control equal to zero if a shareholder is not ranked first, calculate the MHHI deltas accordingly, and then run a version of the baseline specification. We then repeat the procedure but assign control equal to zero if a shareholder is not ranked second, and so on. Figure IA.4 plots the estimated coefficients from this exercise for shareholders ranked 1 to 10, together with 95% confidence bands. Only common ownership by shareholders ranked first and second has a positive and highly statistically significant effect on ticket prices. Common ownership and control by shareholders ranked 3 to 10 has a small and insignificant effect on ticket prices. These results are consistent with standard notions of corporate governance, but inconsistent with the hypothesis that various forms of misspecification mechanically drive a spurious correlation between MHHI delta and ticket prices.

C.2. Banzhaf Voting Power Indices as Control Shares

In our calculation of MHHI deltas, thus far we have assumed that shareholder control is proportional to the number of shares they own. As an alternative, we now calculate MHHI delta using Banzhaf indices of voting power, defined as the probability that a shareholder is pivotal in an election with two options (perhaps directors) when the other shareholders randomize their voting with equal probability for each option. Table IV, specification (5), reports regression results with this modification relative to the benchmark. The results are similar in magnitude to the baseline, which suggests that the proportional control assumption is not driving the baseline results.

C.3. Effect of Common Ownership by Shareholder Horizon

The previous tests indicate that the incentives of only the most powerful shareholders are reflected in airlines' pricing decisions. One might further suspect that in addition to holding large stakes, influence requires holding shares for a sufficiently long period of time (Chen, Harford, and Li (2007)). Indeed, an effect driven by shareholdings held for only a short amount of time might raise concerns about a misspecified empirical model. We measure a shareholder's horizon at a given point in time as the churn ratio, calculated as in Gaspar, Massa, and Matos (2005) (using shareholders' ownership in all industries, not just airlines). We then divide shareholders into terciles based on their churn ratios for each year-quarter and call shareholders in the top (bottom) tercile "high-churn" ("low-churn"). We assign zero control to short-horizon investors and run the baseline specification using these modified MHHI deltas. We then repeat the exercise but additionally assign zero control to shareholders not ranked 1 or 2. The results are reported in Table VII. We find that only common ownership by long-horizon shareholders has a significant positive effect on prices,

Table VII around here

while common ownership by short-horizon shareholders yields coefficients of varying sign and weak (if any) significance. The same is true for the ranked-1-or-2 specifications. In sum, only economically meaningful ways of calculating common ownership concentration are linked to significant product market outcomes.

D. Robustness to the Mode of Competition

The reduced-form measure of common ownership concentration that we use above reflects the ownership networks' density. However, it can also be derived from and interpreted within a Cournot model. This feature does not imply that our empirical tests rely on the assumption that airlines necessarily compete à la Cournot, as we now show.[13]

We propose a measure of common ownership at the carrier-route level, which we refer to as carrier-route common ownership (CRCO), that is equal to the market-share-weighted average of the weight that the carrier places on the profits of other carriers in the route relative to its own profits. Specifically, CRCO for carrier j in route r in year-quarter t is given by

$$\text{CRCO}_{jrt} = \sum_{k \neq j} \frac{\sum_i \gamma_{ij,t}\beta_{ik,t}}{\sum_i \gamma_{ij,t}\beta_{ij,t}} \frac{s_{k,rt}}{1 - s_{j,rt}}. \tag{6}$$

This measure is proportional to the Gross-Upward Pricing Pressure Index, or GUPPI, which was introduced by Hausman, Moresi, and Rainey (2011) in the context of differentiated-product Bertrand competition, if diversion is proportional to market shares (as in a simple multinomial logit model), prices do not vary across carriers within a market, and markups

[13] That said, the strategic, longer-term pricing patterns that we study are implied by capacity pre-commitments, which typically occur about one year before the flight. This feature, as well as previous literature (Brander and Zhang (1990)), suggest a Cournot model.

are constant. While it is helpful to have an economic interpretation in the context of a differentiated-goods Bertrand model of competition (although under admittedly stringent assumptions), we use this measure, as we did for MHHI delta, as a reduced-form measure of common ownership concentration. Interestingly, the measure can also be interpreted as a share-weighted average of the objective function weights that the various firms place on competitors' profit. Note further that CRCO uses less information about competition in the route than MHHI delta, since the latter includes information about the level of common ownership between other carriers in the same route, in addition to information about common ownership between the carrier in the observation and its competitors. To the extent that common ownership between competitors in the same route is relevant, one should expect the measure to have less predictive power than MHHI delta.

Table IV, specification (6), shows that the effect of the carrier-route-level common ownership measure is positive and statistically significant at the 1% level, but the t-statistics are lower than those in the baseline specification for MHHI delta, as expected. (Because the common ownership measure employed here is different from MHHI delta, the point estimate is not quantitatively comparable to the baseline.) The loss of power is also consistent with the data favoring a Cournot model over Bertrand as the relevant model of competition in the airline industry, as previously argued by Brander and Zhang (1990) and the literature that followed.

To further assure robustness to the mode of competition, we investigate whether the estimated effect of common ownership is driven by multimarket contact. Table IV, specification (7), shows that there is a positive and highly statistically significant effect of multimarket contact on ticket prices, measured as average route contact as in Evans and Kessides (1994); see Ciliberto and Williams (2014) for a structural version. However, the effect of MHHI delta

remains significant and the estimated coefficients are little changed.

E. What Else Can We Learn About the Mechanism?

We now 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.[14] Such an interaction effect could arise if it is 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). At 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 compete with a large player (i.e., markets with an HHI close to 10,000). On the other hand, there might be few such opportunities, making the effect more difficult to estimate. We investigate these hypotheses by running a price regression on MHHI delta interacted with a tenth-order polynomial of HHI, as well as all previously considered controls. Figure IA.5 shows the results. Consistent with the above hypotheses, we find a significant effect for routes within a range of HHI between around 2,500 and 6,500.

If investors spend time communicating their incentives to portfolio firms, and portfolio firms exert costly effort to implement these incentives, these efforts should be concentrated in markets that matter more for the bottom line, that is, in larger markets. We present specifications interacting MHHI delta with a polynomial in market size percentiles in Figure IA.6. The effect of MHHI delta is statistically significant for all market size percentiles except the very smallest and the very largest markets, for which the error bands become

[14] We thank Severin Borenstein for this suggestion.

wide. Indeed, the effect of MHHI delta on prices increases with market size. This finding not only corroborates the basic narrative above, but also confirms that the main results are not driven by a small markets effect.

Another interesting question is to what extent does time-variation in ownership at the firm level, rather than time-variation at the firm-market level, drive the results. For example, carriers may compete more or less aggressively due to changes in common ownership by diversified institutional investors' governance styles (Edmans, Levit, and Reilly (2016)), regardless of the routes they compete in. Unfortunately, this effect is difficult to distinguish from a change in MHHI delta, much of which is driven by firm-level variation. We can nevertheless provide suggestive evidence by including carrier-year-quarter fixed effects. Table IV, specification (8), reports the results. We find that the estimated coefficient MHHI delta is lower than in the baseline but still highly statistically significant, suggesting that some but not all of the baseline effects come from route-level variation. It is difficult to determine whether the attenuation is due to measurement noise and the removal of identifying information, or to changes in firm-level governance (or other changes at the firm-time level such as financial distress) that coincide with more common ownership.

As an alternative way to determine the level at which incentives are implemented, we estimate specifications including the average of MHHI delta across all of the routes in which the carrier operates (we call this the carrier-level MHHI delta), as well as the MHHI delta or the route of the observation. Table IA.VIII shows that the coefficient on the route-level MHHI delta is highly statistically significant but the point estimate is lower than in the baseline estimates. Similarly, the coefficient on the carrier-level MHHI delta is statistically significant and large, ranging from 0.91 to 1. As these results illustrate, we conduct our analyses at the route level because doing so allows us to control for route-level characteristics, not necessarily

because we believe that the majority of the effects are implemented at the route level . The majority of the effect of common ownership on competitive strategy may be implemented at the firm-pair level, or even at the firm level.

To further investigate this question, Table IA.VIII also includes specifications controlling for the average carrier-level MHHI delta across all competitors in a route (excluding the carrier of the observation). We refer to this measure as the average carrier-level MHHI delta of competitors. We find that the coefficient on the route-level MHHI delta continues to be statistically significant, but again lower than in the baseline. The coefficient on the average carrier-level MHHI delta of other carriers is positive but not statistically significant. Section V provides anecdotal evidence that some shareholder initiatives do indeed appear to be focused at the route level, though most publicly available evidence on shareholder engagement is broader, and at the firm level.

F. External Validity

The limited availability of large-scale datasets on product prices covering a comprehensive set of producers and a broad cross-section of markets makes it difficult to find other econometrically clean settings in which to test the common ownership theory. However, since first making our study available online, similar results have been found in other industries and using other econometric methods, which increases confidence in the external validity of our results. In particular, Azar, Raina, and Schmalz (2016) find that the combination of common ownership and cross-ownership of U.S. banks leads to higher prices on retail deposit products and lower deposit interest rates, using within-bank variation across branches over time and variation in county-level common ownership resulting from index fund growth as

an instrument.[15] Lundin (2016) shows that joint profit maximization of commonly owned Swedish power plants best matches the data on maintenance decisions, and hence output, compared to unilateral profit maximization. Freeman (2016) finds an effect of common ownership on the longevity of customer-supplier relationships, which supports the assumption of the various theoretical models motivating our empirical analysis that firms internalize externalities imposed on commonly owned firms. Gutiérrez and Philippon (2017) find that in a broad cross-section of U.S. firms, common ownership is negatively related to firms' propensity to invest amid high profitability and Q. It thus appears that evidence for the external validity of the anticompetitive effects hypothesis is already significant, and continuing to grow.

V. Institutional Background and Potential Mechanisms

Above we document a robust statistical link between common ownership concentration and higher prices. In this section we discuss potential mechanisms, both direct and indirect, that could implement these results.

[15] Azar, Raina, and Schmalz (2016) also show that omitting common ownership from regressions of price on industry concentration (HHI) leads to a negative omitted variable bias on the HHI coefficient. Analyses of industry structure should therefore not be dismissed based on a lack of evidence that HHIs *alone* are associated with higher prices. Instead, researchers should recognize that ownership structure is part of industry structure.

A. *The Indirect Channel: Doing Nothing*

Table I makes clear that a large degree of common ownership is driven by large institutional investors, specifically, by large mutual fund families. It strikes some as surprising that mutual funds, often thought to be "lazy investors,"[16] would actively engage with portfolio firms with the aim of decreasing the extent of product market competition. However, the claim that common ownership leads to higher prices is very different from the claim that an individual shareholder actively and consciously pursues an anticompetitive agenda, influences managers of portfolio firms to compete less aggressively against each other, or even incites collusion. Indeed, any such notion is not implied by our empirical results thus far, nor do the results depend on it or the motivating theory suggest it.

To see why *doing nothing* is sufficient for common ownership to lead to higher prices, assume that increasing market share requires managerial effort, which is privately costly. For instance, entering new markets and attracting new customers may require successful R&D, extensive market research, unpleasant price wars with incumbents, and effort at a personal cost. If "lazy investors" do not insist on the implementation of expansion strategies, managers can enjoy the "quiet life" that comes with choosing suboptimal quantities (Hicks (1935)).[17] If a match between lazy principals and lazy agents becomes pervasive in an industry, then in a Cournot model context, industry output declines and margins increase (see Antón, Ederer, Giné, and Schmalz (2017)). Diversified shareholders have little incentive to intervene and

[16] Economist, February 2015, Capitalism's unlikely heroes – shareholder activists.

[17] Several initiatives by large asset managers to isolate management from activists in the name of preventing short-termism (see e.g. Sorkin, Andrew Ross, February 2, 2016, Some Heresy on Wall Street: Look Past the Quarter, *New York Times*) may have this outcome as a side effect.

change such an equilibrium. One should therefore not expect large diversified mutual fund families to actively push for more aggressive product market behavior between portfolio firms, given that doing so would not only be costly, but also go against incentives to maximize the value of the family's total portfolio. Also, we are not aware of any evidence to that effect.

By contrast, it is well documented that campaigns by activist investors, which typically concentrate their capital in one target firm per industry, lead to increases in target market share at the expense of its rivals (e.g., Aslan and Kumar (2016)). When industry competitors are owned by concentrated activists that push their targets to compete aggressively, a more competitive outcome obtains.

The past three decades have witnessed a shift from the low-common-ownership equilibrium to the high-common-ownership equilibrium, with diversified institutions increasingly crowding out concentrated owners as firms' most powerful shareholders. One should thus expect a decrease in the extent of competition, even when diversified owners do nothing to actively reduce the competitiveness of their portfolio firms' product markets. This may be one reason why antitrust law explicitly recognizes that a "passive" change of incentives is sufficient to implement anticompetitive outcomes (Elhauge (2015)).

In sum, large diversified mutual fund families doing nothing, that is, not pushing portfolio firms to compete aggressively against each other, can implement the outcomes we document. Active engagement in corporate governance on behalf of common owners merely exacerbates the problem.

B. Effects of Investor Influence on Corporate Financial Decisions

It is well recognized in the literature that ownership by a particular set of investors can affect corporate financial decisions, whereas corporate financial choices can affect firms'

product market strategy (Brander and Lewis (1986), Chevalier (1995), Kovenock and Phillips (1995), Phillips (1995), Dasgupta and Titman (1998)). Hence, any influence of ownership by a particular set of investors on a portfolio firm's capital structure or payout decisions can affect the product market equilibrium. For example, increased payouts imply reduced investment (at least in the long run), and reduced investment in production capacity implies less competitive product markets. The effects of shareholder influence on product market outcomes can therefore be subtle and indirect. Nonetheless, what follows, we provide suggestive evidence that some interactions between investors and portfolio firms are directly concerned with product market considerations.

C. The Direct Channel: Voice, Incentives, and the Vote

To start, we wish to clarify a common confusion by quoting Vanguard's CEO and Chairman William McNabb: "Some have mistakenly assumed that our predominantly passive management style suggests a passive attitude with respect to corporate governance ... Nothing could be further from the truth".[18] Vanguard further explains, "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." Recent research confirms that mutual fund families engage much like other investors do, albeit more often "behind the scenes" (McCahery, Starks, and Sautner (2016), Dimson, Karakaş, and Li (2015), Appel, Gormley, and Keim (2016), Mullins (2014), Boone and White (2015),

[18] Stein, Charles, March 4, 2015, Vanguard's McNabb says firm is not passive on governance, *Bloomberg*, https://www.bloomberg.com/news/articles/2015-03-04/vanguard-s-mcnabb-says-firm-is-not-passive-on-governance

Schmidt and Fahlenbrach (2017)), and sometimes coordinate their activities in "secret summits" (Financial Times, referenced above). The largely "passive" asset management firms such as BlackRock, Vanguard, and State Street thus play an important role in most corporate governance decisions of publicly traded firms in America, with their power having been compared to that of J.P. Morgan and John D. Rockefeller.[19]

In this section we present evidence suggesting that, indeed, some common owners (*i*) use *voice* to communicate their preferred product market strategies, (*ii*) use management *incentive* (i.e., pay) structures that implicitly reward executives for less aggressive competition, and (*iii*) use the power of their *vote* to thwart efforts of undiversified shareholders that push for more competition.

C.1. Voice

According to large asset managers, making their voice heard in private engagement meetings is the most important mechanism through which they influence corporate governance. According to their websites and letters to CEOs, some of the large "passive" asset managers request that firms provide them with long-term strategic plans regarding growth and profitability, so that they can evaluate based on their implementation of those strategic plans. Asset managers also frequently managers engage in direct discussions with portfolio firms. BlackRock, for instance, claims more than a thousand private meetings in previous governance reports. In addition, activists occasionally demand board seats to ensure implementation of the desired product market strategy; Reuters reports on such an event in the

[19] Krouse, Sarah, David Benoit, and Tom McGinty, October 24, 2016, Meet the new corporate power brokers: Passive investors, *Wall Street Journal*

airline industry.[20] Bloomberg further reports that amid rising political pressure to reduce drug prices, mutual fund companies Fidelity, T. Rowe Price, and Wellington invited several pharma managers to a Boston hotel and encouraged them to "defend their pricing."[21] Matt Levine[22] similarly cites a portfolio manager at Hodges Capital Management Inc. as indicating that "I'd like to see [Southwest Airlines] boost their fares but also cut capacity," and notes that Hodges owns shares in airlines including United Continental, Delta, American, Alaska and Virgin America, as well as Southwest. In the business press, concerns have been raised about the potential for "monopolistic behavior" by Warren Buffett despite the classification of Berkshire Hathaway's airline holdings as "passive" investments, as referenced in the introduction. Reuters further reports that the alleged Hart-Scott-Rodino Antitrust Act violation by an activist with common ownership interests in natural competitors[23] "could call into question routine practices across ... the mutual fund industry," noting that "some

[20] February 20, 2008, Hayman to nominate candidates for Express-Jet board, *Reuters*, https://www.reuters.com/article/hayman-expressjet/update-1-hayman-to-nominate-candidates-for-expressjet-board-idUSN2034449720080220?dlbk

[21] Chen, Caroline, May 11, 2016, Mutual Fund Industry to Drugmakers: Stand Up and Defend Yourself, *Bloomberg*, https://www.bloomberg.com/news/articles/2016-05-09/top-funds-said-to-tell-pharma-leaders-to-defend-drug-pricing

[22] Levine, Matt, July 29, 2016, Ebay arbitrage and airline competition, *BloombergView*, http://www.bloomberg.com/view/articles/2016-07-29/ebay-arbitrage-and-airline-competition

[23] Flaherty, Michael, and Diane Bartz, April 4, 2016, U.S. regulator sues ValueAct over Halliburton-Baker Hughes disclosures, *Reuters*, http://www.reuters.com/article/us-bakerhughes-m-a-halliburton-valueact-idUSKCN0X11UL

communications the government cites as evidence are similar to discussions that ... traditional, buy-and-hold funds" commonly have with their portfolio firms.[24] A leading German newspaper reports that a top manager of a large mutual fund family – Deutsche Bank's largest shareholder around that time – stated which of the bank's competitors would (not) be suitable merger targets amid a perceived level of excess competition.[25] Reuters also reports that "activists court passive shareholders before launching such a campaign, and passive investors recruit activists to agitate, [...] blurring boundaries between activist and traditional fund managers."[26] The Federal Trade Commission has since clarified that "'Investment-only' means just that."[27] However, notwithstanding abundant anecdotal evidence of large asset managers (e.g., BlackRock (2011)) using private communications to discuss "nuanced and sensitive" topics, knowledge about the level of detail at which product market strategy is discussed remains limited.

Given the scarcity of information on the content of private engagement meetings, we turn to earnings calls of U.S. airlines to assess the level of detail at which investors and manage-

[24] Flaherty, Michael, and Ross Kerber, April 12, 2016, U.S. lawsuit against activist ValueAct puts mutual funds on alert, *Reuters*, http://www.reuters.com/article/us-valueact-lawsuit-funds-idUSKCN0X92E6

[25] Frankfurter Allgemeine Zeitung, October 4, 2016, Fondsriese Blackrock wirbt für Fusionen europäischer Großbanken, http://www.faz.net/aktuell/wirtschaft/fondsriese-blackrock-wirbt-fuer-fusionen-europaeischer-grossbanken-14466436.html

[26] Flaherty, Michael, and Ross Kerber, April 12, 2016, U.S. lawsuit against activist ValueAct puts mutual funds on alert, *Reuters*, http://www.reuters.com/article/us-valueact-lawsuit-funds-idUSKCN0X92E6

[27] Feinstein, Debbie, Ken Libby, and Jennifer Lee, 2015, "Investment-only" means just that, *FTC*, https://www.ftc.gov/news-events/blogs/competition-matters/2015/08/investment-only-means-just

ment publicly discuss product market strategy. We find that route-level capacity decisions are a frequent topic of conversation. For example, a representative of a financial institution ranking among the top five owners of various airlines criticizes management for "growth initiatives out of LA, Seattle," asks whether capacity increases to "Miami, Frankfurt could have an effect of reducing some of the existing service here," cautions management that "adding capacity into other airlines' hubs diminishes your shareholders' confidence and jeopardizes [your stock price]," and notes elsewhere that his questions are "not uniquely directed" and similar to conversations he has with "others this season." The evidence thus suggests that investors and portfolio firms do indeed discuss product market strategy, sometimes even at the market level. We next explore whether managers have incentives to act in line with common owners' economic interests.

C.2. Incentives

Actively managed funds can threaten management with selling the stock if management does not follow their desired product market strategy, which may explicitly feature not entering competitors' markets. The resulting decline in stock price would have obvious direct consequences for managerial incentives. However, many firms' largest shareholders are "passive" institutions that do not have the option of selling. Nonetheless, they have sufficient power to shape managerial incentives. "Passive" investors claim to address the structure of management pay in 45% of engagement meetings; perhaps not surprisingly, after such engagement, they almost always vote for the proposed plans, with the result that incentives are often much less sensitive to (relative) performance than other investors would prefer.[28] Less

[28] See Melby, Caleb, and Alicia Ritcey, February 17, 2016, Vanguard, BlackRock seen seldom challenging CEO pay plans, *Bloomberg*, https://www.bloomberg.com/news/

performance-sensitive compensation packages can reduce managers' incentive to compete.

Indeed, a long literature in economics rationalizes the scarcity of relative performance incentives as a result of managerial contracts designed to implement shareholder's desired product market strategy and soften competition e.g., Fershtman and Judd (1987), Sklivas (1987), and Aggarwal and Samwick (1999). Antón, Ederer, Giné, and Schmalz (2017) further show that common owners have reduced incentives to implement compensation schemes that make a manager's wealth sensitive to performance. Empirically, top managers' wealth-performance sensitivity is negatively related to various measures of common ownership concentration.[29] A caveat is that explicit incentives are in place only as long as the manager is not fired. However, CEO turnover does not feature strong elements of relative performance evaluation; rather, it is sensitive to industry performance (Jenter and Kanaan (2015)). Hence, career

articles/2016-02-17/vanguard-blackrock-seen-seldom-challenging-companies-on-ceo-pay, and Melin, Anders, August 23, 2016, 'Earnings hysteria' pits ISS against Clinton and Fink on CEO pay, *Bloomberg*, https://www.bloomberg.com/news/articles/2016-08-23/-earnings-hysteria-pits-iss-against-clinton-and-fink-on-ceo-pay.

[29] Whether the prediction of a negative relation between common ownership and relative performance evaluation is borne out in the data is subject of recent interest. Antón, Ederer, Giné, and Schmalz (2017) provide evidence that management pay becomes less sensitive to performance relative to industry rivals when the industry becomes more commonly owned. Liang (2016) independently shows that pay-performance sensitivities decline with common ownership, using firm-level variation, alternative functional forms, and a different identification strategy. Kwon (2016) challenges existing theory and empirical findings using alternative samples, industry definitions, and empirical specifications, claiming qualitatively opposite results on pay-performance sensitivities, and documents a link between common ownership and the explicit use of relative performance evaluation in compensation contracts.

concerns give managers incentives to maintain a "healthy" level of industry profitability. We conclude that compensation contracts can be used to align managers' strategic incentives with those of common shareholders.

C.3. Vote

Voting against management is the ultimate step toward aligning incentives between shareholders and their agents. BlackRock's proxy voting guidelines indicate "that we typically only vote against management when direct engagement has failed." In effect, engagement is the carrot, voting is the stick. In line with this view, the head of corporate governance at State Street Global Advisors explains that "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."[30] We do not mean to suggest here that shareholders vote directly on competitive strategies. However, they do vote on director candidates. Consistent with the large "passive" institutions having a less-than-perfectly passive approach to governance, "boards now routinely vet director candidates with major shareholders before their names are placed on the proxy."[31] Director candidates may be able to credibly signal which type of competitive strategy they stand for. For example, Berkshire Hathaway's Co-CIO would reduce Berkshire's portfolio value if he used his role as a JPMorgan board member to propose a particularly aggressive competitive strategy against American Express,

[30] Scott, Mike, April 6, 2014, Passive investment, active ownership, *Financial Times*

[31] Charan, Ram, Michael Useem, and Dennis Carey, February 9, 2015, Your board should think like an activist, *HBR.org*, https://hbr.org/2015/02/your-board-should-be-full-of-activists

Bank of America, or Wells Fargo, in all of which Berkshire Hathaway is the largest investor.[32] Azar (2012, 2017) shows theoretically that shareholder voting on directors and managers can lead firms to act as if they maximized an objective function similar to the one assumed in the derivation of the common ownership concentration index we use in our empirical work. Fos and Tsoutsoura (2014) and Aggarwal, Dahiya, and Prabhala (2015) show empirically that director elections matter because of career concerns.

D. Summary

In sum, we find that voice, incentives, and vote – as well as doing nothing, that is, simply not pushing for more aggressive competition – can plausibly implement the anticompetitive incentives of investors that hold large stakes in natural competitors. Schmalz provides a case study that contains all four of these elements.[33] An activist investor with concentrated holdings in a target *voiced* demand for greater effort in increasing market share vis-à-vis the target's competitors, as well as greater use of relative performance evaluation to give management appropriate *incentives* to maximize the target's value, among other things. Institutional Shareholder Services recommended supporting the activist's campaign, but BlackRock, Vanguard, and StateStreet cast decisive *votes* against. "The most plausible hypothesis is that the large asset managers are concerned about the impact of hedge fund activism on their

[32] Buhayar, Noah, September 20, 2016, Buffett's investing deputy combs named to JPMorgan's board, *Bloomberg*, https://www.bloomberg.com/news/articles/2016-09-20/jpmorgan-chase-names-buffett-deputy-combs-to-board-of-directors

[33] Schmalz, Martin, May 18, 2015, How passive funds prevent competition, http://ericposner.com/martin-schmalz-how-passive-funds-prevent-competition/.

broader portfolio."[34] Moreover, it is also possible to interpret the vote against as the "passive" investors choosing not to actively implement pro-competitive measures themselves or to support a campaign that would have likely led to more aggressive competition. The case study thus illustrates the shift of power from concentrated to diversified investors.

Because there are many plausible channels through which shareholder incentives can translate into firm behavior, we find it unlikely that a single mechanism is solely responsible. This insight is important, as it suggests that the common ownership problem is not likely to be solved by shutting down a particular channel. For example, managers are unlikely to be isolated from common owners' anticompetitive incentives if regulators prohibit communication about competition, but permit conversations about pay structure or voting on board members. Moreover, given that "doing nothing" is a possible mechanism, finding conclusive evidence for a mechanism could prove elusive even if a robust causal relation exists.

[34] See Coffee, John, June 1, 2015, The lessons of DuPont, Columbia Law School Blue Sky Blog, http://clsbluesky.law.columbia.edu/2015/06/01/the-lessons-of-dupont-corporate-governance-for-dummies/. While the big "passive" fund families vote against activists more often than not, they do so selectively. Empirical study of the types of campaigns they tend to support is challenging because of the difficulty involved with classifying campaigns that have multiple objectives, and because of a selection effect – researchers do not observe the proxy fights that did not happen because of expected opposition by the "passive" funds; see Ackman, William, 2016, Pershing Square annual letter, https://assets.pershingsquareholdings.com/2014/09/Pershing-Square-2015-Annual-Letter-PSH-January-26-2016.pdf.

VI. Conclusion

This paper presents evidence of large anticompetitive incentives due to common ownership links at the market level, and of a causal link between common ownership concentration and higher product prices. In particular, using the U.S. airline industry as our test setting, we find that a modified index of market concentration that accounts for the extent to which competitors are owned by the same investors points to levels of market concentration that far exceed those indicated by the conventional measure of market concentration. Common ownership concentration for the average route is more than 10 times larger than the threshold level "likely to enhance market power" in the case of a traditional merger, according to the U.S. Antitrust Agencies' Horizontal Merger Guidelines. In theory, the additional concentration that results from cumulating many small common ownership interests should be reflected in higher prices.

We find that when firms have reduced incentives to compete due to common ownership, prices are higher and output is lower. Specifically, using 14 years of market-firm-level quarterly panel data, we find that airline ticket prices are 3% to 7% higher due to common ownership, compared to a counterfactual world in which firms are separately owned or in which firms ignore the anticompetitive incentives their owners due to common ownership. When we exploit variation in common ownership concentration generated by the merger of two large asset managers that arguably occurred for reasons unrelated to expected route-level differences in U.S. airline ticket prices, we find that product prices are 10% to 12% higher due to common ownership. These results suggest both a large deadweight loss (i.e., decreased efficiency of the economy) and a large wealth transfer from consumers to producers due to common ownership.

If robust, our findings raise several questions for academic research in industrial organi-

zation, finance, and legal studies. Specifically, a ubiquitous assumption in finance research is that firms' objective is to maximize their own value, and that firm policies and investors' optimization problems are separable. Our results can be viewed as challenging this assumption, and thus make an empirical case for taking seriously the theoretical insight (perhaps most clearly stated in Hart (1979)) that shareholders may not agree on profit maximization as an objective when firms are not price takers. An open question in that case is what *is* the objective of the firm, and how might it be determined through interactions of shareholders with varying interests. The objective assumed in the derivation of the MHHI is but one candidate.

As for the fast-growing literature on the implications of our findings for antitrust and corporate law, we refer the reader to Elhauge (2015), Baker (2016), and various responses to those papers.

Tackling the competitive risks due to common ownership also presents challenges for policy makers, not only from a political but also from a conceptual perspective. Specifically, this paper emphasizes the empirical importance of deciding on the optimal mix between three desirable but not jointly attainable goals of a capitalist system. When firms implement shareholders' incentives, and all shareholders (including those with significant control) are fully diversified, product market competition will tend towards monopolistic outcomes, with an associated deadweight loss for the economy. Therefore, the three goals of (i) perfect shareholder diversification, (ii) firm maximization of shareholder interests ("good governance"), and (iii) preservation of competitive product markets cannot be simultaneously achieved (Azar (2012)). The first two goals benefit shareholders. By contrast, the decline in product market competition implied by an improved implementation of the first two goals is a social cost that thus far has been largely ignored. However, the implications of decreased

competition such as increased inequality, slow macroeconomic growth, and low real interest rates despite sustained and high profit margins are of much interest to policy makers and the population at large (Elhauge (2015)).[35] What is the optimal tradeoff between the three goals above is thus a hotly debated question in the public domain.[36]

While we do not propose a solution for the tradeoff illustrated above, two direct policy implications of the present paper arise at a more practical level. First, empirical measures of market concentration should take ownership into account. Second, regulators should keep in mind that consolidation in the asset management industry can adversely affect competition in the product markets of their portfolio companies. Therefore, when antitrust authorities evaluate such propositions, the potential benefits to shareholders 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 offered by portfolio firms.

This paper and the above discussion emphasize anticompetitive effects of common ownership. In theory, of course, common ownership can also have efficiency-enhancing effects. Which effect prevails is an open empirical question.

---

[35] See also public commentary by Summers, Larry, March 30, 2016, Corporate profits are near record highs. Here's why that's a problem, *Washington Post*, https://www.washingtonpost.com/news/wonk/wp/2016/03/30/larry-summers-corporate-profits-are-near-record-highs-heres-why-thats-a-problem/ and Stiglitz, Joseph, May 13, 2016, Monopoly's new era, *Project Syndicate*, https://www.project-syndicate.org/commentary/high-monopoly-profits-persist-in-markets-by-joseph-e--stiglitz-2016-05.

[36] The first academic policy proposal is by Posner, Scott Morton, and Weyl (2017), see also Posner, Eric A., Fiona M. Scott Morton, and E. Glen Weyl, Dec 7, 2016, A Monopoly Donald Trump Can Pop, *New York Times*. Industry representatives have responded in various outlets as well, see e.g. Novick, Barbara, January 9, 2017, How Index Funds Democratize Investing, *Wall Street Journal*.

Initial submission: March 3, 2015; Accepted: August 28, 2017 Editors: Bruno Biais, Michael R. Roberts, and Kenneth J. Singleton

References

Admati, Anat R., Paul Pfleiderer, and Josef Zechner, 1994, Large shareholder activism, risk sharing, and financial market equilibrium, *Journal of Political Economy* 102, 1097–1130.

Aggarwal, Reena, Sandeep Dahiya, and Nagpurnanand Prabhala, 2015, The power of shareholder votes: Evidence from director elections, *SSRN 2609532* Working paper, Georgetown University.

Aggarwal, Rajesh K., and Andrew A. Samwick, 1999, Executive compensation, strategic competition, and relative performance evaluation: Theory and evidence, *Journal of Finance* 54, 1999–2043.

Antón, Miguel, Florian Ederer, Mireia Giné, and Martin Schmalz, 2017, Common ownership, competition, and top management incentives, *Available at SSRN 2802332* Working paper, IESE / Yale SOM / University of Michigan.

Appel, Ian, Todd Gormley, and Donald Keim, 2016, Passive investors, not passive owners, *Journal of Financial Economics* 121, 111–141.

Aslan, Hadiye, and Praveen Kumar, 2016, The product market effects of hedge fund activism, *Journal of Financial Economics* 119, 226–248.

Atalay, Enghin, Ali Hortaçsu, and Chad Syverson, 2014, Vertical integration and input flows, *American Economic Review* 104, 1120–1148.

Azar, José, 2012, A new look at oligopoly: Implicit collusion through portfolio diversification, Ph.D. thesis, Princeton University.

——— , 2017, Portfolio diversification, market power, and the theory of the firm, *Available at SSRN 2811221* Working paper, IESE.

——— , Sahil Raina, and Martin Schmalz, 2016, Ultimate ownership and bank competition, *Available at SSRN 2710252* Working paper, IESE / University of Alberta / University of Michigan.

Baker, Jonathan B., 2016, Overlapping financial investor ownership, market power, and antitrust enforcement: My qualified agreement with Professor Elhauge, *Harvard Law Review Forum* 129, 212–232.

Bebchuk, Lucian A., Reinier Kraakman, and George Triantis, 2000, Stock pyramids, cross-ownership, and dual class equity: The mechanisms and agency costs of separating control from cash-flow rights, in *Concentrated Corporate Ownership* (University of Chicago Press).

Benninga, Simon, and Eitan Muller, 1979, Majority choice and the objective function of the firm under uncertainty, *Bell Journal of Economics* 12, 670–682.

Bernheim, B. Douglas, and Michael D. Whinston, 1985, Common marketing agency as a device for facilitating collusion, *RAND Journal of Economics* pp. 269–281.

Berry, Steven, and Panle Jia, 2010, Tracing the woes: An empirical analysis of the airline industry, *American Economic Journal: Microeconomics* 2, 1–43.

Bertrand, Marianne, and Sendhil Mullainathan, 2003, Enjoying the quiet life? Corporate governance and managerial preferences, *Journal of Political Economy* 111, 1043–1075.

BlackRock, 2011, Corporate governance and responsible investment at BlackRock, Annual Review.

Bolle, Friedel, and Werner Güth, 1992, Competition among mutually dependent sellers, *Journal of Institutional and Theoretical Economics (JITE)/Zeitschrift für die gesamte Staatswissenschaft* 148, 209–239.

Boone, Audra L., and Joshua T. White, 2015, The effect of institutional ownership on firm transparency and information production, *Journal of Financial Economics* 117, 508–533.

Borenstein, Severin, 1990, Airline mergers, airport dominance, and market power, *American Economic Review* 80, 400–404.

——— , and Nancy L. Rose, 1994, Competition and price dispersion in the U.S. airline industry, *Journal of Political Economy* 102, 653–683.

——— , 1995, Bankruptcy and pricing behavior in the U.S. airline markets, *American Economic Review* 85, 397–402.

Brander, James A., and Tracy R. Lewis, 1986, Oligopoly and financial structure: The limited liability effect, *American Economic Review* 76, 956–970.

Brander, James A., and Anming Zhang, 1990, Market conduct in the airline industry: An empirical investigation, *RAND Journal of Economics* 21, 567–583.

Brav, Alon, Wei Jiang, and Hyunseob Kim, 2011, The real effects of hedge fund activism: Productivity, risk, and product market competition, Discussion paper National Bureau of Economic Research.

Brav, Alon, Wei Jiang, Frank Partnoy, and Randall Thomas, 2008, Hedge fund activism, corporate governance, and firm performance, *Journal of Finance* 63, 1729–1775.

Bresnahan, Timothy F., and Steven C. Salop, 1986, Quantifying the competitive effects of production joint ventures, *International Journal of Industrial Organization* 4, 155–175.

Brueckner, Jan K., Darin Lee, and Ethan S. Singer, 2013, Airline competition and domestic U.S. airfares: A comprehensive reappraisal, *Economics of Transportation* 2, 1–17.

Brueckner, Jan K., and W. Tom Whalen, 2000, The price effects of international airline alliances, *Journal of Law and Economics* 43, 503–546.

Casella, Alessandra, Aniol Llorente-Saguer, and Thomas R. Palfrey, 2012, Competitive equilibrium in markets for votes, *Journal of Political Economy* 120, 593–658.

Chen, Xia, Jarrad Harford, and Kai Li, 2007, Monitoring: Which institutions matter?, *Journal of Financial Economics* 86, 279–305.

Chevalier, Judith A., 1995, Capital structure and product-market competition: Empirical evidence from the supermarket industry, *American Economic Review* 85, 415–435.

Ciliberto, Federico, and Jonathan W. Williams, 2014, Does multimarket contact facilitate tacit collusion? Inference on conduct parameters in the airline industry, *RAND Journal of Economics* 45, 764–791.

Clayton, Matthew J., and Bjorn N. Jorgensen, 2005, Optimal cross holding with externalities and strategic interactions, *Journal of Business* 78, 1505–1522.

Crès, Hervé, and Mich Tvede, 2005, Portfolio diversification and internalization of production externalities through majority voting, Working paper, HEC.

Dasgupta, Sudipto, and Sheridan Titman, 1998, Pricing strategy and financial policy, *Review of Financial Studies* 11, 705–737.

Davis, Gerald F., 2008, A new finance capitalism? Mutual funds and ownership re-concentration in the United States, *European Management Review* 5, 11–21.

——— , 2013, After the corporation, *Politics & Society* 41, 283–308.

Dekel, Eddie, Matthew O. Jackson, and Asher Wolinsky, 2008, Vote buying: General elections, *Journal of Political Economy* 116, 351–380.

Dekel, Eddie, and Asher Wolinsky, 2012, Buying shares and/or votes for corporate control, *Review of Economic Studies* 79, 196–226.

DeMarzo, Peter M., 1993, Majority voting and corporate control: The rule of the dominant shareholder, *Review of Economic Studies* 60, 713–734.

Dimson, Elroy, Oğuzhan Karakaş, and Xi Li, 2015, Active ownership, *Review of Financial Studies* 28, 3225–3268.

Edmans, Alex, Doron Levit, and Devin Reilly, 2016, Governing multiple firms, Working Paper, London Business School and Wharton.

Elhauge, Einer, 2015, Horizontal shareholding, *Harvard Law Review* 129, 1267–1317.

Evans, William N., and Ioannis N. Kessides, 1994, Living by the "Golden Rule": Multimarket contact in the U.S. airline industry, *Quarterly Journal of Economics* 109, 341–366.

Faccio, Mara, and Larry HP Lang, 2002, The ultimate ownership of Western European corporations, *Journal of Financial Economics* 65, 365–395.

Farrell, Joseph, 1985, Owner-consumers and efficiency, *Economics Letters* 19, 303–306.

Fershtman, Chaim, and Kenneth L. Judd, 1987, Equilibrium incentives in oligopoly, *American Economic Review* 77, 927–940.

Fichtner, Jan, Eelke M. Heemskerk, and Javier Garcia-Bernardo, 2016, Hidden power of the big three? Passive index funds, re-concentration of corporate ownership, and new financial risk, *Available at SSRN 2798653* Working Paper, University of Amsterdam.

Flath, David, 1991, When is it rational for firms to acquire silent interests in rivals?, *International Journal of Industrial Organization* 9, 573–583.

——— , 1992, Horizontal shareholding interlocks, *Managerial and Decision Economics* 13, 75–77.

Forbes, Silke Januszewski, and Mara Lederman, 2009, Adaptation and vertical integration in the airline industry, *American Economic Review* 99, 1831–1849.

Forbes, Silke J, and Mara Lederman, 2010, Does vertical integration affect firm performance? Evidence from the airline industry, *RAND Journal of Economics* 41, 765–790.

Foros, Øystein, Hans Jarle Kind, and Greg Shaffer, 2011, Mergers and partial ownership, *European Economic Review* 55, 916–926.

Fos, Vyacheslav, and Margarita Tsoutsoura, 2014, Shareholder democracy in play: Career consequences of proxy contests, *Journal of Financial Economics* 114, 316–340.

Freeman, Kayla, 2016, The effects of common ownership on customer-supplier relationships, *Available at SSRN 2873199* Working paper, Indiana University.

Gaspar, José-Miguel, Massimo Massa, and Pedro Matos, 2005, Shareholder investment horizons and the market for corporate control, *Journal of Financial Economics* 76, 135–165.

Gaspar, José-Miguel, Massimo Massa, and Pedro Matos, 2006, Favoritism in mutual fund families? Evidence on strategic cross-fund subsidization, *Journal of Finance* 61, 73–104.

Gilo, David, Yossi Moshe, and Yossi Spiegel, 2006, Partial cross ownership and tacit collusion, *RAND Journal of Economics* 37, 81–99.

Goolsbee, Austan, and Chad Syverson, 2008, How do incumbents respond to the threat of entry? Evidence from the major airlines, *Quarterly Journal of Economics* 123, 1611–1633.

Gordon, Roger H., 1990, Do publicly traded corporations act in the public interest?, Discussion paper National Bureau of Economic Research.

——— , 2003, Do publicly traded corporations act in the public interest?, *The B.E. Journal of Economic Analysis and Policy* 3.

Gutiérrez, Germán, and Thomas Philippon, 2017, Investment-less growth: An empirical investigation, Working paper, NYU.

Hansen, Robert G., and John R. Lott, 1996, Externalities and corporate objectives in a world with diversified shareholder/consumers, *Journal of Financial and Quantitative Analysis* 31, 43–68.

Harford, Jarrad, Dirk Jenter, and Kai Li, 2011, Institutional cross-holdings and their effect on acquisition decisions, *Journal of Financial Economics* 99, 27–39.

Hart, Oliver D., 1979, On shareholder unanimity in large stock market economies, *Econometrica: Journal of the Econometric Society* 47, 1057–1083.

Hartzell, Jay C., and Laura T. Starks, 2003, Institutional investors and executive compensation, *Journal of Finance* 58, 2351–2374.

Hausman, Jerry, Serge Moresi, and Mark Rainey, 2011, Unilateral effects of mergers with general linear demand, *Economics Letters* 111, 119–121.

He, Jie Jack, and Jiekun Huang, 2017, Product market competition in a world of cross-ownership: Evidence from institutional blockholdings, *The Review of Financial Studies* 30, 2674–2718.

Hicks, John R., 1935, Annual survey of economic theory: The theory of monopoly, *Econometrica* 3, 1–20.

IATA, 2008, Air travel demand, *IATA Economics Briefing* p. 7.

——— , 2015, Airline profitability strengthens further, *IATA Press Release* p. 1.

ICI, 2015, Investment Company Fact Book, .

Jenter, Dirk, and Fadi Kanaan, 2015, CEO turnover and relative performance evaluation, *Journal of Finance* 70, 2155–2184.

Kim, E. Han, and Vijay Singal, 1993, Mergers and market power: Evidence from the airline industry, *American Economic Review* 83, 549–569.

Kovenock, Dan, and Gordon Phillips, 1995, Capital structure and product-market rivalry: How do we reconcile theory and evidence?, *American Economic Review* 85, 403–408.

Kwoka, John, Kevin Hearle, and Phillippe Alepin, 2016, From the fringe to the forefront: Low cost carriers and airline price determination, *Review of Industrial Organization* 48, 247–268.

Kwon, Heung Jin, 2016, Executive compensation under common ownership, Working Paper, Korea Institute of Finance.

Lederman, Mara, 2007, Do enhancements to loyalty programs affect demand? The impact of international frequent flyer partnerships on domestic airline demand, *RAND Journal of Economics* 38, 1134–1158.

Liang, Lantian, 2016, Common ownership and executive compensation, Working Paper, UT Dallas.

Lundin, Erik, 2016, Market power and joint ownership: Evidence from nuclear plants in Sweden, *Available at SSRN 2743221*.

Luo, Dan, 2014, The price effects of the Delta/Northwest airline merger, *Review of Industrial Organization* 44, 27–48.

Malueg, David A., 1992, Collusive behavior and partial ownership of rivals, *International Journal of Industrial Organization* 10, 27–34.

Margotta, Donald, 2010, Adolf Berle and revolution in the modern corporation, *Business Review* 15, 62–67.

Matvos, Gregor, and Michael Ostrovsky, 2008, Cross-ownership, returns, and voting in mergers, *Journal of Financial Economics* 89, 391–403.

——— , 2010, Heterogeneity and peer effects in mutual fund proxy voting, *Journal of Financial Economics* 98, 90–112.

McCahery, Joseph, Laura Starks, and Zacharias Sautner, 2016, Behind the scenes: The corporate governance preferences of institutional investors, *Journal of Finance* 71, 2905–2932.

Mullainathan, Sendhil, and David Scharfstein, 2001, Do firm boundaries matter?, *American Economic Review* 91, 195–199.

Mullins, William, 2014, The governance impact of index funds: Evidence from regression discontinuity, Working Paper, Sloan School of Management, Massachusetts Institute of Technology.

Nain, Amrita, and Yan Wang, 2016, The product market impact of minority stake acquisitions, *Management Science* 64, 825–844.

Nye, William, 1992, Can a joint venture lessen competition more than a merger?, *Economics Letters* 40, 487–489.

O'Brien, Daniel P., and Steven C. Salop, 2000, Competitive effects of partial ownership: Financial interest and corporate control, *Antitrust Law Journal* 67, 559–614.

Parker, Philip M, and Lars-Hendrik Röller, 1997, Collusive conduct in duopolies: Multimarket contact and cross-ownership in the mobile telephone industry, *RAND Journal of Economics* 28, 304–322.

Peters, Craig, 2006, Evaluating the performance of merger simulation: Evidence from the US airline industry, *Journal of Law and Economics* 49, 627–649.

Phillips, Gordon M., 1995, Increased debt and industry product markets an empirical analysis, *Journal of Financial Economics* 37, 189–238.

Posner, Eric A., Fiona M. Scott Morton, and E. Glen Weyl, 2017, A proposal to limit the anti-competitive power of institutional investors, *Antitrust Law Journal* forthcoming.

Reitman, David, 1994, Partial ownership arrangements and the potential for collusion, *Journal of Industrial Economics* 42, 313–322.

Reynolds, Robert J., and Bruce R. Snapp, 1986, The competitive effects of partial equity interests and joint ventures, *International Journal of Industrial Organization* 4, 141–153.

Roe, Mark J., 1990, Political and legal restraints on ownership and control of public companies, *Journal of Financial Economics* 27, 7–41.

Rotemberg, Julio, 1984, Financial transaction costs and industrial performance, Working Paper, MIT.

Rubin, Amir, 2006, Diversification and corporate decisions, *Corporate Ownership and Control* 3, 209–212.

Schmidt, Cornelius, and Rüdiger Fahlenbrach, 2017, Do exogenous changes in passive institutional ownership affect corporate governance and firm value?, *Journal of Financial Economics* 124, 285–304.

Sklivas, Steven D., 1987, The strategic choice of managerial incentives, *RAND Journal of Economics* 18, 452–458.

Vitali, Stefania, James B. Glattfelder, and Stefano Battiston, 2011, The network of global corporate control, *PloS one* 6, e25995.

Werden, Gregory J., Andrew S. Joskow, and Richard L. Johnson, 1991, The effects of mergers on price and output: Two case studies from the airline industry, *Managerial and Decision Economics* 12, 341–352.

Zwiebel, Jeffrey, 1995, Block investment and partial benefits of corporate control, *Review of Economic Studies* 62, 161–185.

Table I

Illustrative Cases of Within-Industry Common Ownership Links.

This table shows the largest (institutional and non-institutional) beneficial owners and corresponding stakes for an illustrative sample of U.S. publicly traded natural competitors as of 2016Q2. The data source is *S&P Capital IQ*. Panel C corresponds to Azar, Raina, and Schmalz (2016). Berkshire's holdings in Bank of America (*) are warrants without voting rights. Panel D reflects holdings as of 2016Q4.

Panel A: Technology Firms

Apple	*[%]*	*Microsoft*	*[%]*
Vanguard	6.05	Vanguard	6.41
BlackRock	5.72	BlackRock	5.80
State Street	3.82	Capital Research	4.76
Fidelity	2.34	- Steve Ballmer -	4.24
Northern Trust Corporation	1.26	State Street	3.80
		- Bill Gates -	2.54
		T. Rowe Price	2.27

Panel B: Pharmacies

CVS	*[%]*	*Walgreens Boots Alliance*	*[%]*	*Rite Aid*	*[%]*
Vanguard	6.66	-Stefano Pessina-	13.06	Vanguard	7.24
BlackRock	6.02	Vanguard	5.58	BlackRock	4.20
State Street	4.00	BlackRock	4.55	Arrowgrass Capital	3.55
Fidelity	3.67	KKR	3.38	Franklin Resources	2.87
Wellington	2.37	State Street	3.34	Pentwater Capital	1.89
		T. Rowe Price	2.70		

Panel C: Banks

JPMorgan Chase	*[%]*	*Bank of America*	*[%]*	*Citigroup*	*[%]*
Vanguard	6.28	Berkshire Hathaway*	6.90	BlackRock	6.43
BlackRock	6.28	Vanguard	5.94	Vanguard	5.96
State Street	4.12	BlackRock	5.94	State Street	4.04
Capital Research	3.68	State Street	4.01	Fidelity	3.00
Fidelity	2.10	Fidelity	2.37	Invesco	1.67
Wells Fargo	*[%]*	*PNC Financial*	*[%]*	*U.S. Bancorp*	*[%]*
Berkshire Hathaway	10.46	Wellington	8.34	BlackRock	6.51
Vanguard	5.67	Vanguard	6.30	Berkshire Hathaway	5.94
BlackRock	5.42	BlackRock	5.03	Vanguard	5.59
State Street	3.68	State Street	4.33	Fidelity	4.12
Wellington	2.55	Barrow Hanley	3.71	State Street	3.84

Table I
Illustrative Cases of Within-Industry Common Ownership Links (continued)

Panel D: Airlines

Delta Air Lines	*[%]*	*Southwest Airlines Co.*	*[%]*	*American Airlines*	*[%]*
Berkshire Hathaway	8.25	PRIMECAP	11.78	T. Rowe Price	13.99
BlackRock	6.84	Berkshire Hathaway	7.02	PRIMECAP	8.97
Vanguard	6.31	Vanguard	6.21	Berkshire Hathaway	7.75
State Street Global Advisors	4.28	BlackRock	5.96	Vanguard	6.02
J.P. Morgan Asset Mgt.	3.79	Fidelity	5.53	BlackRock	5.82
Lansdowne Partners Limited	3.60	State Street Global Advisors	3.76	State Street Global Advisors	3.71
PRIMECAP	2.85	J.P. Morgan Asset Mgt.	1.31	Fidelity	3.30
AllianceBernstein L.P.	1.67	T. Rowe Price	1.26	Putnam	1.18
Fidelity	1.54	BNY Mellon Asset Mgt.	1.22	Morgan Stanley	1.17
PAR Capital Mgt.	1.52	Egerton Capital (UK) LLP	1.10	Northern Trust Global Inv	1.02
United Continental Holdings	*[%]*	*Alaska Air*	*[%]*	*JetBlue Airways*	*[%]*
Berkshire Hathaway	9.20	T. Rowe Price	10.14	Vanguard	7.96
BlackRock	7.11	Vanguard	9.73	Fidelity	7.58
Vanguard	6.88	BlackRock	5.60	BlackRock	7.33
PRIMECAP	6.27	PRIMECAP	4.95	PRIMECAP	5.91
PAR Capital Mgt.	5.18	PAR Capital Mgt.	3.65	Goldman Sachs Asset Mgt.	2.94
State Street Global Advisors	3.45	State Street Global Advisors	3.52	Dimensional Fund Advisors	2.42
J.P. Morgan Asset Mgt.	3.35	Franklin Resources	2.59	State Street Global Advisors	2.40
Altimeter Capital Mgt.	3.26	BNY Mellon Asset Mgt.	2.34	Wellington	2.07
T. Rowe Price	2.25	Citadel	1.98	Donald Smith Co.	1.80
AQR Capital Management	2.15	Renaissance Techn.	1.93	BarrowHanley	1.52
Spirit Airlines	*[%]*	*Allegiant Travel Company*	*[%]*	*Hawaiian*	*[%]*
Fidelity	10.70	Gallagher Jr., M. J. (Chairman, CEO)	20.30	BlackRock	11.20
Vanguard	7.41	BlackRock	8.61	Vanguard	10.97
Wellington	5.44	Renaissance Techn.	7.28	Aronson, Johnson, Ortiz, LP	5.99
Wasatch Advisors Inc.	4.33	Vanguard	6.65	Renaissance Techn.	4.67
BlackRock	3.77	Fidelity	5.25	Dimensional Fund Advisors	3.17
Jennison Associates	3.49	Franklin Resources	4.52	State Street Global Advisors	2.43
Wells Capital Mgt.	3.33	Wasatch Advisors Inc.	4.39	PanAgora Asset Mgt.	2.22
Franklin Resources	2.79	T. Rowe Price	4.23	LSV Asset Management	2.22
OppenheimerFunds.	2.67	TimesSquare Capital Mgt.	3.91	BNY Mellon Asset Mgt.	1.84
Capital Research and Mgt.	2.64	Neuberger Berman	3.07	Numeric Investors	1.79

Table II
Summary Statistics

This table shows summary statistics of our sample, both at the market-carrier level and at the market level. Data on airfares and market characteristics come from the Department of Transportation; data on ownership come from 13f filings and proxy statements. We exclude routes with less than 20 passengers per day on average. MHHI delta is the increase in concentration due solely to common ownership. Other variable definitions are provided in the Internet Appendix.

	Mean	Std. Dev.	Min.	Max.	N
Market-Carrier Level					
Average Fare	229.16	97.5	25	2498.62	1312778
Log Average Fare	5.37	0.36	3.22	7.82	1312778
HHI	4639.46	2076.81	971.16	10000	1312778
MHHI	6493.13	1654.73	2039.11	10218.54	1243621
MHHI delta	1870.24	1127.29	0	5798.57	1243621
Number of Nonstop Carriers	0.81	1.3	0	11	1312778
Southwest Indicator	0.09	0.29	0	1	1312778
Other LCC Indicator	0.09	0.28	0	1	1312778
Share of Passengers Traveling Connect, Market Level	0.67	0.39	0	1	1312778
Share of Passengers Traveling Connect	0.86	0.32	0	1	1312778
Population	2.42	2.01	0.02	16.32	1215267
Income Per Capita	41.89	4.9	21.53	92.5	1215267
Distance	2686.52	1552.06	27	12714	1312778
Average Passengers	3930.37	11590.52	10	234146	1312778
Market Level					
Average Fare	219.31	72.52	29.66	1045.88	282333
Log Average Fare	5.34	0.33	3.39	6.95	282333
HHI	5264.44	2370.44	971.16	10000	282333
MHHI	6976.12	1767.65	2039.11	10218.54	262766
MHHI delta	1731.44	1206.51	0	5798.57	262766
Number of Nonstop Carriers	0.73	1.19	0	11	282333
Southwest Indicator	0.09	0.29	0	1	282333
Other LCC Indicator	0.08	0.27	0	1	282333
Share of Passengers Traveling Connect, Market Level	0.64	0.41	0	1	282333
Share of Passengers Traveling Connect	0.64	0.41	0	1	282333
Population	2.28	1.97	0.02	16.32	255384
Income Per Capita	41.59	5.06	21.53	92.5	255384
Distance	2342.93	1520.76	27	11920.14	282333
Average Passengers	18428.79	33341.41	1800	386097.72	282333
Correlation Between HHI and MHHI: 0.87					
Correlation Between HHI and MHHI delta: -0.69					

Table III

Effect of Common Ownership on Airline Ticket Prices: Panel Regressions

This table shows regressions of the logarithm of average ticket prices on common ownership concentration, HHI, as well as various controls and fixed effects. MHHI delta measures the part of market concentration that is due to common ownership. Data are for the period 2001Q1 to 2014Q4. 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 double-cluster standard errors at the market-carrier and year-quarter levels. For the market-level regressions, we weight by average passengers in the market over time and double-cluster standard errors at the market and year-quarter levels. Other variable definitions are provided in the Internet Appendix. While in the paper HHI and MHHI are expressed on a scale from 0 to 10,000, we use a scale of 0 to 1 in the regressions. *** p<0.01, ** p<0.05, * p<0.1.

	Dependent Variable: Log(Average Fare)					
	Market-carrier level			Market level		
	(1)	(2)	(3)	(4)	(5)	(6)
MHHI delta	0.194***	0.219***	0.149***	0.325***	0.311***	0.202***
	(0.0459)	(0.0387)	(0.0375)	(0.0446)	(0.0397)	(0.0356)
HHI	0.221***	0.230***	0.165***	0.365***	0.357***	0.255***
	(0.0247)	(0.0246)	(0.0209)	(0.0315)	(0.0313)	(0.0244)
Number of Nonstop Carriers			-0.00979***			-0.00810**
			(0.00269)			(0.00371)
Southwest Indicator			-0.120***			-0.149***
			(0.00928)			(0.0135)
Other LCC Indicator			-0.0618***			-0.100***
			(0.00717)			(0.00989)
Share of Passengers Traveling Connect, Market Level			0.124***			0.158***
			(0.0167)			(0.0189)
Share of Passengers Traveling Connect			0.0986***			
			(0.0143)			
Log(Population)			0.306***			0.343***
			(0.106)			(0.122)
Log(Income Per Capita)			0.374***			0.304***
			(0.102)			(0.110)
Log(Distance) × Year-Quarter FE		✓	✓		✓	✓
Year-Quarter FE	✓	✓	✓	✓	✓	✓
Market-Carrier FE	✓	✓	✓			
Market FE				✓	✓	✓
Observations	1,237,584	1,237,584	1,209,517	262,350	262,350	254,999
R^2	0.820	0.825	0.836	0.852	0.861	0.876
Number of market-carrier pairs	46,513	46,513	45,248			
Number of markets				7,185	7,185	6,906

Table IV

Effect of Common Ownership on Airline Ticket Prices: Robustness

This table shows various robustness tests of the panel regression of ticket prices on common ownership concentration and various controls presented in Table III. MHHI delta measures the part of market concentration that is due to common ownership. Data are for the period 2001Q1 to 2014Q4. 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 double-cluster standard errors at the market-carrier and year-quarter levels. For the market-level regressions, we weight by average passengers in the market over time and double-cluster standard errors at the market and year-quarter levels. Other variable definitions are provided in the Internet Appendix. While in the paper HHI and MHHI are expressed on a scale of 0 to 10,000, we use a scale of 0 to 1 in the regressions. The Banzhaf control shares are calculated by Monte Carlo simulation using 10,000 random draws for each firm-year-quarter. *** p<0.01, ** p<0.05, * p<0.1.

	Dependent Variable: Log(Average Fare)							
	Excl. Bankruptcy Periods (1)	Inst. Ownership Controls (2)	City-Pairs City-Pairs (3)	HHI Polynomial (4)	Banzhaf Ctrl Shrs (5)	CRCO (6)	Multi-Market Contact (7)	Carrier-Time FE (8)
MHHI delta	0.265***	0.235***	0.287***	0.183***	0.181***		0.192***	0.0765***
	(0.0535)	(0.0354)	(0.0398)	(0.0363)	(0.0352)		(0.0352)	(0.0270)
Carrier-Route Common Ownership						0.0347***		
						(0.0112)		
Log(Multi-Market Contact)							0.0457***	
							(0.00537)	
HHI	0.290***	0.261***	0.401***		0.247***	0.125***	0.258***	0.115***
	(0.0293)	(0.0232)	(0.0381)		(0.0243)	(0.0174)	(0.0233)	(0.0167)
Number of Nonstop Carriers	-0.0149***	-0.00886**	0.00335	-0.00803**	-0.00814**	-0.0100***	-0.00718**	-0.0113***
	(0.00523)	(0.00359)	(0.00301)	(0.00364)	(0.00371)	(0.00268)	(0.00353)	(0.00213)
Southwest Indicator	-0.141***	-0.140***	-0.119***	-0.147***	-0.149***	-0.117***	-0.150***	-0.106***
	(0.0160)	(0.0132)	(0.0122)	(0.0136)	(0.0135)	(0.00927)	(0.0135)	(0.00862)
Other LCC Indicator	-0.0907***	-0.0986***	-0.0443***	-0.0992***	-0.101***	-0.0656***	-0.0907***	-0.0579***
	(0.0117)	(0.00992)	(0.0101)	(0.00996)	(0.00993)	(0.00731)	(0.00956)	(0.00631)
Share of Passengers Traveling Connect, Market Level	0.132***	0.152***	0.291***	0.170***	0.158***	0.133***	0.151***	0.107***
	(0.0227)	(0.0193)	(0.0210)	(0.0187)	(0.0189)	(0.0162)	(0.0195)	(0.0151)
Share of Passengers Traveling Connect						0.0940***		0.133***
						(0.0146)		(0.0140)
Log(Population)	0.540***	0.273**	0.454***	0.338***	0.346***	0.304***	0.328**	0.137*
	(0.133)	(0.122)	(0.139)	(0.123)	(0.123)	(0.108)	(0.127)	(0.0800)
Log(Income Per Capita)	0.422***	0.285**	0.240**	0.303***	0.306***	0.374***	0.302**	0.215***
	(0.145)	(0.107)	(0.104)	(0.109)	(0.110)	(0.102)	(0.117)	(0.0757)
Percent Institutional Ownership		-0.0762***						
		(0.0187)						
Institutional Ownership Concentration		-0.110*						
		(0.0568)						
Top 5 Holdings as Pct. of Total Institutional Holdings		0.154***						
		(0.0420)						
Log(Distance) × Year-Quarter FE	✓	✓	✓	✓	✓	✓	✓	✓
10-th Order Polynomial in HHI				✓				
Year-Quarter FE	✓	✓	✓	✓	✓	✓	✓	
Market-Carrier FE						✓		✓
Market FE	✓	✓	✓	✓	✓		✓	
Carrier-Year-Quarter FE								✓
Observations	127,128	254,999	201,983	254,999	254,999	1,209,517	244,257	1,209,496
R^2	0.886	0.878	0.890	0.877	0.876	0.836	0.874	0.855
Number of markets	6,470	6,906	5,305	6,906	6,906		6,553	
Number of market-carrier pairs						45,248		45,243

Table V

Effect of Common Ownership on Airline Ticket Prices: Distributed-Lag Regressions

This table shows dynamic panel regressions of ticket prices on leads and lags of common ownership concentration as well as HHI and various controls. Common ownership is measured as MHHI delta. Data are for the period 2001Q1 to 2014Q4. 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 double-cluster standard errors at the market-carrier and year-quarter levels. For the market-level regressions, we weight by average passengers in the market over time and double-cluster standard errors at the market and year-quarter levels. MHHI delta is the increase in concentration due solely to common ownership. Other variable definitions are provided in the Internet Appendix. While in the paper HHI and MHHI are expressed on a scale of 0 to 10,000, we use a scale of 0 to 1 in the regressions. *** p<0.01, ** p<0.05, * p<0.1.

	Dependent Variable: Log(Average Fare)					
	Market-carrier level			Market level		
	(1)	(2)	(3)	(4)	(5)	(6)
MHHI delta - Lead	-0.0722	-0.0397	-0.0502	-0.0176	0.000444	-0.0224
	(0.0618)	(0.0531)	(0.0497)	(0.0620)	(0.0535)	(0.0496)
MHHI delta	0.110	0.104	0.0452	0.181*	0.159**	0.0802
	(0.0918)	(0.0710)	(0.0669)	(0.0917)	(0.0726)	(0.0666)
MHHI delta - Lag	0.159**	0.170***	0.161***	0.178**	0.177***	0.162***
	(0.0693)	(0.0538)	(0.0506)	(0.0685)	(0.0544)	(0.0492)
HHI - Lead	0.0252	0.0412*	0.0132	0.0650**	0.0592**	0.0362
	(0.0254)	(0.0226)	(0.0218)	(0.0261)	(0.0251)	(0.0246)
HHI	0.00598	0.00260	-0.00494	0.0775**	0.0893***	0.0405
	(0.0353)	(0.0282)	(0.0261)	(0.0384)	(0.0326)	(0.0297)
HHI - Lag	0.218***	0.220***	0.182***	0.274***	0.256***	0.214***
	(0.0290)	(0.0254)	(0.0237)	(0.0298)	(0.0269)	(0.0248)
Number of Nonstop Carriers			-0.00906***			-0.00703*
			(0.00267)			(0.00369)
Southwest Indicator			-0.119***			-0.149***
			(0.00950)			(0.0135)
Other LCC Indicator			-0.0616***			-0.0983***
			(0.00713)			(0.00984)
Share of Passengers Traveling Connect, Market Level			0.137***			0.158***
			(0.0162)			(0.0195)
Share of Passengers Traveling Connect			0.0699***			
			(0.0142)			
Log(Population)			0.280**			0.323**
			(0.105)			(0.122)
Log(Income Per Capita)			0.345***			0.288***
			(0.0975)			(0.107)
Log(Distance) × Year-Quarter FE		✓	✓		✓	✓
Year-Quarter FE	✓	✓	✓	✓	✓	✓
Market-Carrier FE	✓	✓	✓			
Market FE				✓	✓	✓
Observations	1,002,802	1,002,802	982,245	221,674	221,674	216,175
R^2	0.836	0.841	0.851	0.857	0.865	0.879
Number of market-carrier pairs	35,840	35,840	35,038			
Number of markets				5,872	5,872	5,698

Table VI

Effect of Common Ownership on Airline Ticket Prices: IV Regressions Using Continuous Treatment – Second Stage

This table shows the second stage of instrumental-variables regressions of tickets prices on the increase in common ownership implied by a hypothetical combination of BlackRock and BGI's pre-merger portfolios. MHHI delta measures the part of market concentration that is due to common ownership. The pre-period is 2009Q1 (the quarter before the BlackRock acquisition of Barclays BGI 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, and (iii) we calculate the difference between the counterfactual and the actual for each market. We use the resulting implied change in MHHI delta as a continuous treatment variable. We exclude markets with less than 20 passengers per day on average. We exclude market carriers with any missing observations during the period 2006Q2 to 2014Q4. We weight by passengers the market carrier in 2009Q1. Standard errors are robust to heteroskedasticity. Variable definitions are provided in the Internet Appendix. While in the paper HHI and MHHI are expressed on a scale of 0 to 10,000, we use a scale of 0 to 1 in the regressions. *** p<0.01, ** p<0.05, * p<0.1.

	Dependent Variable: Change in Log(Average Fare) 2009Q1-Post					
Post-period:	2010Q1	2011Q1	2012Q1	2013Q1	2014Q1	2010–2014 Q1
	(1)	(2)	(3)	(4)	(5)	(6)
Change in MHHI delta 2009Q1-Post	0.117	0.0743	0.812***	0.315	0.858***	0.466***
	(0.126)	(0.281)	(0.177)	(0.222)	(0.187)	(0.157)
HHI_{2009Q1}	0.0322	0.0272	0.0289	0.0522	0.0812*	0.0444
	(0.0279)	(0.0394)	(0.0366)	(0.0397)	(0.0469)	(0.0319)
Number of Nonstop $Carriers_{2009Q1}$	0.00946**	0.0128**	0.00722	0.0183***	0.0154***	0.0123***
	(0.00371)	(0.00520)	(0.00545)	(0.00497)	(0.00591)	(0.00451)
Southwest $Indicator_{2009Q1}$	0.0143	0.0404***	0.0496***	0.0697***	0.0775***	0.0483***
	(0.00989)	(0.0109)	(0.0125)	(0.0125)	(0.0148)	(0.0102)
Other LCC $Indicator_{2009Q1}$	-0.0111	-0.0288**	0.00277	0.00268	0.0105	-0.00494
	(0.0110)	(0.0133)	(0.0135)	(0.0142)	(0.0158)	(0.0114)
Share of Passengers Traveling $Connect_{2009Q1}$	0.0303***	0.0538***	0.0240**	0.0252**	0.0350***	0.0336***
	(0.00864)	(0.00995)	(0.0111)	(0.0116)	(0.0126)	(0.00894)
Share of Passengers Traveling Connect, Market $Level_{2009Q1}$	-0.0296	0.0144	0.00152	0.145***	0.0707**	0.0370*
	(0.0200)	(0.0261)	(0.0275)	(0.0268)	(0.0313)	(0.0222)
Log $(Population)_{2009Q1}$	-0.0106	0.00441	-0.0207**	0.000642	0.000805	-0.00383
	(0.00688)	(0.00773)	(0.00903)	(0.00830)	(0.00895)	(0.00718)
Log (Income Per $Capita)_{2009Q1}$	-0.0518*	0.0296	0.0172	0.0739*	-0.0473	0.00353
	(0.0311)	(0.0344)	(0.0424)	(0.0420)	(0.0452)	(0.0318)
Log $(Distance)_{2009Q1}$	-0.00381	-0.0225***	-0.0244***	-0.0313***	-0.0543***	-0.0275***
	(0.00588)	(0.00692)	(0.00752)	(0.00727)	(0.00816)	(0.00599)
Share DL × Share NW in 2008Q4	0.0639	0.100	0.349	0.477*	0.0396	0.251
	(0.223)	(0.254)	(0.272)	(0.283)	(0.356)	(0.246)
Share UA × Share CO in 2009Q1	0.230	0.939***	1.129***	1.574***	1.573***	1.063***
	(0.174)	(0.315)	(0.321)	(0.351)	(0.317)	(0.214)
Share AA × Share US in 2009Q1	0.206	0.0113	0.536**	0.383	0.849***	0.366*
	(0.143)	(0.284)	(0.258)	(0.235)	(0.310)	(0.202)
Share FL × Share WN in 2009Q1	0.0119	0.0460	0.744***	0.348	0.718***	0.295**
	(0.102)	(0.130)	(0.173)	(0.219)	(0.182)	(0.128)
Share AA in 2009Q1	-0.0131	0.0187	0.0201	-0.0179	0.0132	0.00187
	(0.0169)	(0.0234)	(0.0244)	(0.0223)	(0.0232)	(0.0179)
Percent Change in Income during Great Recession	-0.0301	0.200	0.162	-0.324*	-0.230	-0.0410
	(0.116)	(0.134)	(0.162)	(0.166)	(0.171)	(0.126)
Constant	0.245**	0.110	0.186	-0.0843	0.510***	0.201*
	(0.121)	(0.128)	(0.157)	(0.157)	(0.176)	(0.121)
Observations	7,890	7,890	7,890	7,890	7,890	7,890
R^2	0.030	0.060	0.049	0.072	-0.008	0.068

Table VII

Effect of Common Ownership by High-Churn and Low-Churn Investors on Airline Ticket Prices

This table shows panel regressions similar to those presented in Table III, whereas common ownership concentration is computed assuming control is exercised only by High-(Low-)Churn investors, and investors with Rank 1 or 2 in the ownership structure. Data are for the period 2001Q1 to 2014Q4. 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 double-cluster standard errors at the market-carrier and year-quarter levels. For the market-level regressions, we weight by average passengers in the market over time and double-cluster standard errors at the market and year-quarter levels. We calculate MHHI delta setting control rights to zero for shareholders outside the bottom tercile of the churn ratio, and then for shareholders outside the top tercile of the churn ratio for each market-carrier and date. The churn ratio is calculated as in Gaspar, Massa, and Matos (2005). We then repeat the calculation but also shut down shareholders not ranked 1 or 2 in a given carrier-year-quarter. Variable definitions are provided in the Internet Appendix. While in the paper HHI and MHHI are expressed on a scale of 0 to 10,000, we use a scale of 0 to 1 in the regressions. *** p<0.01, ** p<0.05, * p<0.1.

	Dependent Variable: Log(Average Fare)							
	Shareholders of Any Rank				Shareholders Ranked 1 or 2			
	Market-carrier level		Market level		Market-carrier level		Market level	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
MHHI delta (High-Churn Shareholders)	0.0229		0.0397					
	(0.0262)		(0.0287)					
MHHI delta (Low-Churn Shareholders)		0.0562***		0.0738***				
		(0.0141)		(0.0161)				
MHHI delta (High-Churn Shareholders Ranked 1 or 2)					-0.0451		-0.0234	
					(0.0347)		(0.0372)	
MHHI delta (Low-Churn Shareholders Ranked 1 or 2)						0.0475**		0.0608***
						(0.0204)		(0.0222)
HHI	0.129***	0.157***	0.206***	0.241***	0.124***	0.132***	0.199***	0.208***
	(0.0179)	(0.0182)	(0.0214)	(0.0224)	(0.0175)	(0.0172)	(0.0212)	(0.0210)
Number of Nonstop Carriers	-0.0102***	-0.0102***	-0.00870**	-0.00860**	-0.0101***	-0.0100***	-0.00862**	-0.00848**
	(0.00269)	(0.00269)	(0.00376)	(0.00372)	(0.00271)	(0.00270)	(0.00378)	(0.00375)
Southwest Indicator	-0.118***	-0.117***	-0.147***	-0.146***	-0.118***	-0.119***	-0.147***	-0.148***
	(0.00938)	(0.00926)	(0.0138)	(0.0136)	(0.00941)	(0.00936)	(0.0138)	(0.0137)
Other LCC Indicator	-0.0665***	-0.0641***	-0.107***	-0.104***	-0.0677***	-0.0661***	-0.109***	-0.107***
	(0.00762)	(0.00741)	(0.0104)	(0.0103)	(0.00755)	(0.00745)	(0.0104)	(0.0103)
Share of Passengers Traveling Connect, Market Level	0.132***	0.129***	0.164***	0.164***	0.134***	0.133***	0.165***	0.165***
	(0.0160)	(0.0164)	(0.0186)	(0.0187)	(0.0162)	(0.0162)	(0.0188)	(0.0187)
Share of Passengers Traveling Connect	0.0957***	0.0972***			0.0952***	0.0952***		
	(0.0144)	(0.0144)			(0.0144)	(0.0144)		
Log(Population)	0.298***	0.286**	0.329**	0.318**	0.302***	0.297***	0.334**	0.329**
	(0.109)	(0.108)	(0.127)	(0.125)	(0.109)	(0.109)	(0.127)	(0.127)
Log(Income Per Capita)	0.373***	0.369***	0.301**	0.300***	0.377***	0.378***	0.305***	0.309***
	(0.105)	(0.103)	(0.113)	(0.110)	(0.104)	(0.104)	(0.113)	(0.112)
Log(Distance) × Year-Quarter FE	✓	✓	✓	✓	✓	✓	✓	✓
Year-Quarter FE	✓	✓	✓	✓	✓	✓	✓	✓
Market-Carrier FE	✓	✓	✓	✓				
Market FE					✓	✓	✓	✓
Observations	1,209,517	1,209,517	254,999	254,999	1,209,517	1,209,517	254,999	254,999
R^2	0.835	0.836	0.875	0.876	0.835	0.835	0.875	0.875
Number of market-carrier pairs	45,248	45,248	6,906	6,906	45,248	45,248	6,906	6,906

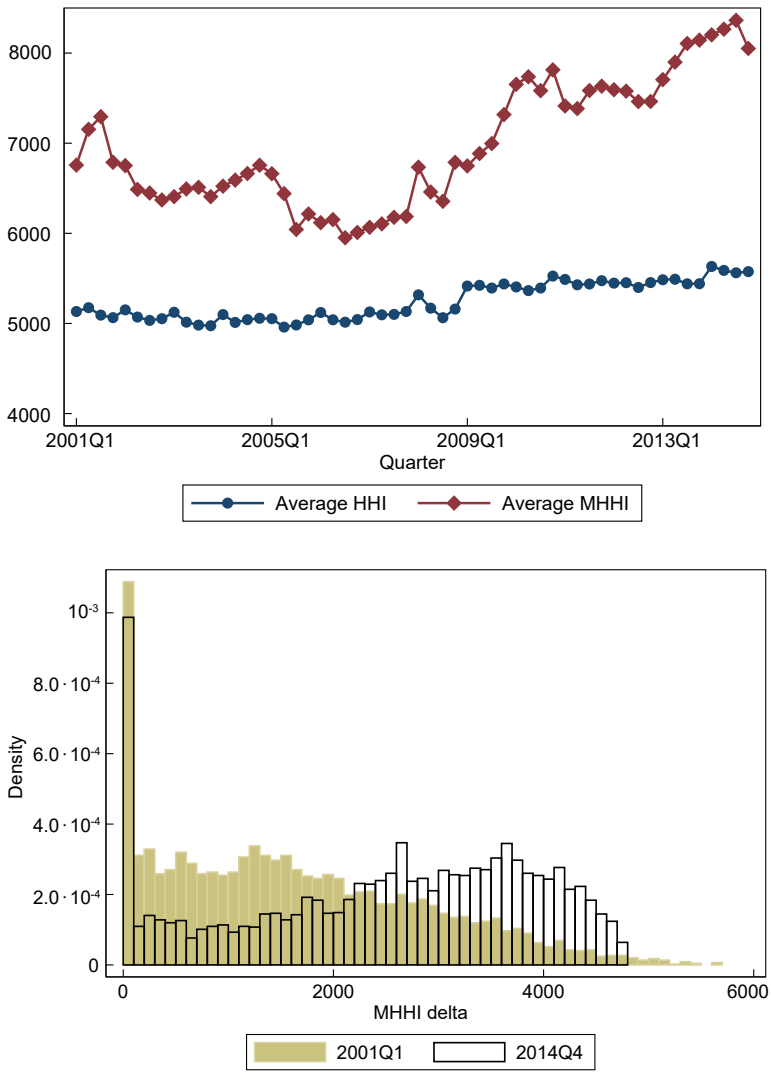

Figure 1. **Time-series and cross-sectional variation of common ownership concentration.** Figure I. The upper figure plots the weighted average of HHI and MHHI across routes from 2001Q1 to 2014Q4. The lower figure plots the distribution of MHHI delta across markets for 2001Q1 and 2014Q4. HHI is the Herfindahl-Hirschman Index, calculated as the sum of the squared market shares for a given route and year-quarter. We exclude international carriers and charter carriers. MHHI is a modified HHI that takes common ownership into account, and is defined in the Internet Appendix. We calculate the index using $MHHI = HHI + \sum_{k \neq j} s_j s_k \frac{\sum_i \gamma_{ij}\beta_{ik}}{\sum_i \gamma_{ij}\beta_{ij}}$, where s_j is the market share of carrier j, γ_{ij} is proportional to the voting share of shareholder i in carrier j, and β_{ij} is the share of carrier j owned by shareholder i. MHHI delta, which is a measure of common ownership among airlines in a route, is the difference between MHHI and 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 Internet Appendix.

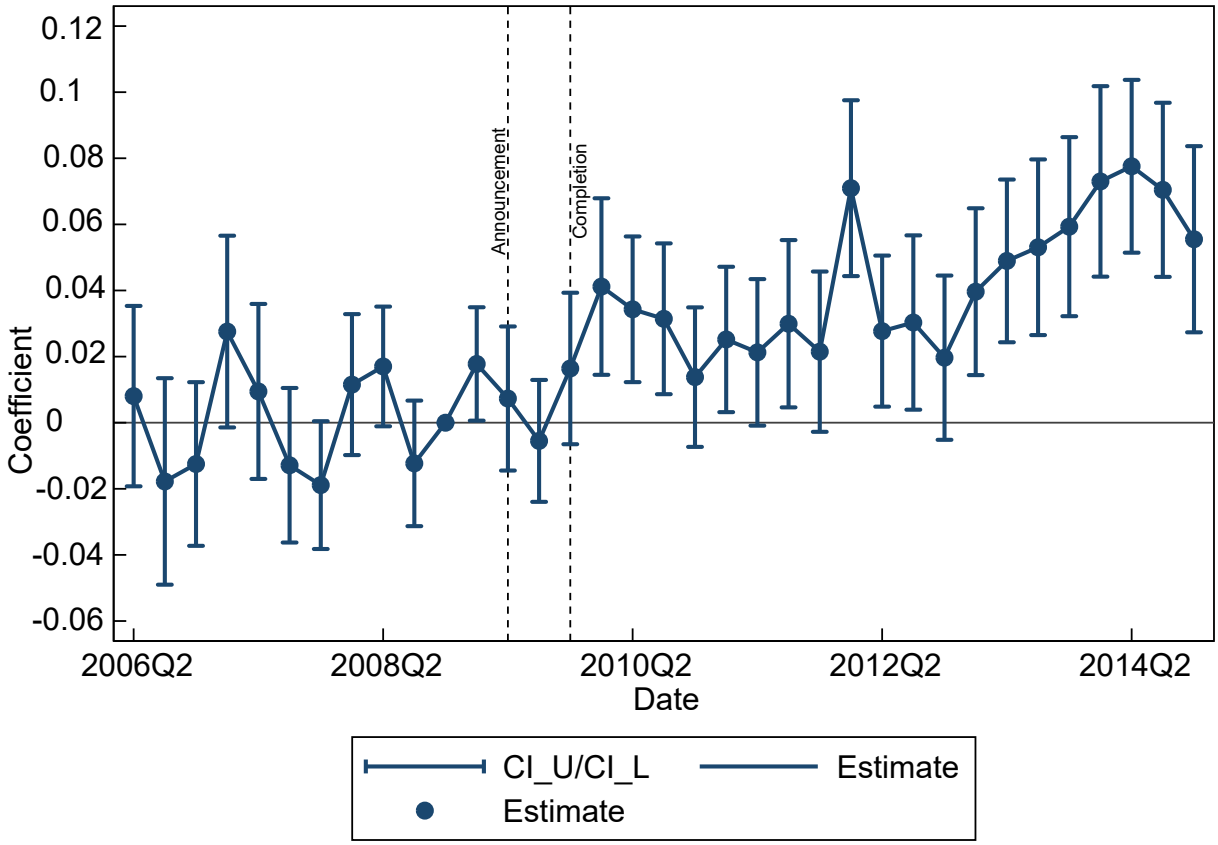

Figure 2. **Estimated coefficients of BlackRock-BGI acquisition treatment indicator interacted with year-quarter fixed effects.**
Figure II. The graph plots the estimated coefficient on interactions of the treatment indicator variable with year-quarter fixed effects. We drop the interaction for 2008Q4, and thus the effect is normalized to zero for that quarter. We control for HHI, the number of nonstop carriers operating in the route, a Southwest indicator, another LCC indicator, log average population in the route endpoints, log average per-capita income in the route endpoints, the share of passengers in the market using connecting flights, and the log distance of the route, each evaluated in 2009Q1 and interacted with year-quarter fixed effects. We also control for potential confounding events using the implied HHI delta in the route from the DL-NW, UA-CO, AA-US, and FL-WN mergers, the share in the route of AA in 2009Q1, and the change in log per-capita income in the route from the start of the Great Recession until 2009Q1, each interacted with year-quarter fixed effects. We weight by average passengers for the market-carrier over time and double-cluster standard errors at the market-carrier and year-quarter levels.