COMMON OWNERSHIP, COMPETITION, AND TOP MANAGEMENT INCENTIVES

By

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John Maynard Keynes Narrates the Great Depression: His Reports to the Philips Electronics Firm

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John Maynard Keynes Narrates the Great Depression: His Reports to the Philips Electronics Firm†

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ABSTRACT
In October 1929, the Dutch electronics firm Philips approached John Maynatd Keynes to write confidential reports on the state of the British and world economies, which he did from January 1930 to November 1934, at first monthly and then quarterly. These substantial reports (Keynes's November 1931 report was twelve typed pages) show Keynes narrating the Great Depression in real time, as the world went through the US slowdown after the Wall Street crash, the Credit-Anstalt collapse in Austria, the German banking crisis (summer 1931), Britain's departure from the gold exchange standard in August and September 1931, the US banking crisis leading to the Bank Holiday of March 1933, the London Economic Conference of 1933, and the coming of the New Deal. This series of reports has not been discussed in the literature, though the reports and surrounding correspondence are in the Chadwyck-Healey microfilm edition of the Keynes Papers. We examine Keynes's account of the unfolding events of the early 1930s, his insistence that the crisis would be more severe and long-lasting than most observers predicted, and his changing position on whether monetary policy would be sufficient to promote recovery and relate his reading of contemporary events to his theoretical development.

Introduction

On October 23, 1929, just as Wall Street began to crash[1] and the world economy moved into exceptionally interesting times, Dr. H. F. van Walsem, counsel and secretary to the Dutch electronics firm N. V. Philips Gloeilampenfabrieken[2], wrote to "J. M. Keynes, Esq., C.B. Cambridge" asking him to write a monthly letter to the firm's Economic Intelligence Service about the state of the British economy and the world economy. John Maynard Keynes's letters to Philips, monthly from January 1930 to November 1931 and then, because of budget cuts to Philips's Economic Intelligence Service, quarterly from February 1932 to November 1934, show Keynes narrating the events of the Great Depression as they occurred, and reveal his perception of the convulsions of the

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world economy as he wrote his *General Theory of Employment, Interest and Money* (1936). This substantial body of Keynes's commentary on economic fluctuations (the November 1931 letter alone is twelve typed, double-spaced pages) has hitherto been neglected in the literature on Keynes. Keynes's reports and the associated correspondence, preserved in the Keynes Papers at King's College, Cambridge, are included in the 1993 Chadwyck-Healey microfilm edition of the Keynes Papers (section BM/5 Memoranda Exchanged with Business Houses), but the expense of this edition (which was sold only as a complete set of 170 reels of microfilm, priced at £9,700 or $17,000, plus $175 for a hardcover catalogue, Cox 1993) meant that only a few copies were sold. According to the WorldCat catalogue, there are five sets in libraries in the United States (Library of Congress, Harvard, Yale, Ohio State, and University of Texas at El Paso), two in Great Britain (Universities of Oxford and Sheffield), one in Canada (Victoria University in the University of Toronto) and a few in Germany (Göttingen), Italy and elsewhere but surprisingly little use has been made even of these copies of Keynes's letters to N. V. Philips. Neither Moggridge (1992) nor Skidelsky (1983–2000, 2003), major biographies of Keynes by the authors who know the Keynes Papers best, mentions Keynes's reports to Philips (but Backhouse and Bateman 2011, 129, have a paragraph about Keynes's July 1930 report). As Jacqueline Cox (1995, 171) notes, the thirty volumes of Keynes's *Collected Writings* (1971–1989) include "only a third of the bulk classified as economic" in the Keynes Papers at King's and do not include Keynes's philosophical papers there, while "the personal papers were barely touched." Donald Moggridge (2006, 136–137) observes that "There has, inevitably, been heavier use of the Keynes Papers in King's College Cambridge, which have the advantage of being available elsewhere on microfilm, than, say, his papers in the National Archives or his correspondence with his publishers, the last of which reveals the risks of depending on the Cambridge collection alone." A vast amount of research has been done about Keynes and his economics, yet not all the relevant material has been explored (see Backhouse and Bateman 2006, Dimand and Hagemann 2019).

These reports reveal Keynes's reading of what was happening in the British and world economies through the first four years of the Great Depression, and provide the empirical counterpart to the record of Keynes's theoretical development in this period given by notes taken by students at Keynes's lectures from 1932 to 1935 (Rymes 1987, 1989, Dimand 1988, Dimand and Hagemann 2019). After the success of *The Economic Consequences of the Peace* (1919), Keynes no longer needed to be paid for lecturing, and so gave a single series of eight lectures each year, on the subject of whatever book he was writing at the time, so his lectures from 1932 to 1935 are in effect annual drafts of the book that became *The General Theory*. These lectures at Cambridge and the reports to N. V. Philips on what was happening in the economy provide theoretical and empirical supplements to Keynes's *Collected Writings* (1971–1989), respectively, in following Keynes's intellectual development in the Great Depression, from *A Treatise on Money* (1930) to *The General Theory* (1936). In Keynes's workload, his reports to Philips from 1930 to 1934 took the place of the London and Cambridge Economics Service Special Memoranda on commodity markets that he wrote from 1923 to 1930 (Keynes [1923–30] 1983, 267–647), which provided an empirical counterpart to his normal backwardation theory of futures contracts ([1923] 1983, 1930, Chapter 29).

Replying on October 31 to von Walsem's letter inviting him to write the monthly letter to the firm's Economic Intelligence Service, Keynes was "quite ready to discuss this proposal with one of your representatives" but wished to clarify "that there will be no question of the publication of the letters and that they will be purely for the information of your own people" – and that "it would not be practicable to me to undertake such work except in return for a somewhat substantial fee which might be higher than you would be willing to offer." On November 4, von Walsem assured him that the letters would not be published and "There are only two persons who, though not in our service, are closely related to our firm, who also receive a copy of our Intelligence Service which they, however, are bound to consider as absolutely confidential." He suggested £100 a year. On November 13, Keynes, having "considered your kind proposal in relation to the fees which I have received on previous occasions for somewhat analogous work," offered to undertake the task for an initial six months, for £150 a year[3]. Although Van Walsem had initially asked for the suggestion of other authors if Keynes preferred not take on the task at the suggested £100 a year, and Keynes equally pointedly offered to suggest such alternative authors if Philips did not care to pay £150 a year, Van Walsem accepted Keynes's terms for Philips on November 22: "We think it desirable that one of our gentlemen will see you in order to discuss some details in the first half of December next."

In the event two representatives of Philips (Messrs. Sannes and du Pré) met with Keynes for a discussion summarized "for good order's sake" by van Walsem on December 21, 1929 (by which time van Walsem had already received a December 18 note by Keynes on the Australian exchange position). He recorded agreement that Keynes's monthly letter would treat "some important factor in the development of the British economic situation and give your opinion as to its effects on trade in general and on our business in particular. Also you will draw our attention to important events in the domains especially interesting us, in so far as these come to your knowledge … Whenever you think it necessary you will give us your views on the situation in different parts of the British Empire or eventually of other countries. If possible we shall suggest [to] you special points to be considered in your letters." Von Walsem wrote again on June 21, 1930 to confirm "that the arrangement has given us full satisfaction so that we are willing to continue on the same terms" and enclosed a cheque for 75 pounds. The arrangement also satisfied Keynes; he wrote on January 1, 1931, that "I have enjoyed preparing the letters." Keynes's letters balanced opinions about trade in general with observations about matters affecting Philips more specifically. Thus on January 11, 1930, Keynes stated that "The Factory capacity for Radio Sets seems to have become quite appalling during 1929" before proceeding more generally "to take this opportunity of emphasizing the anxiety which is felt here about the Australian position … I think that Australia may have more difficulties with her balance of trade during the coming year than the Argentine."[4]

The Slump of 1930: Investment, Debts and Deflation

Keynes's April 1930 letter suggested that, although a general improvement had not yet arrived, "there are a fair number of indications that we may be somewhere in the neighborhood of the bottom point." In particular, "the continuance of cheap money, and even more the expectation of such continuance, is bound to be effective in the situation in the course of a few months," but the effect on employment would be slower than on business feeling and the Stock Exchange and "it would not be surprising to see British unemployment figures go on mounting even to the neighborhood of 2,000,000 up to the end of this calendar year. … The effect of many rationalization schemes now in train will be for some time to come to improve profits rather than employment." With a large amount of Australian gold en route to the Bank of England, "there is less anxiety about the British exchange position than there has been for a very considerable time past" and Keynes expected the creation of the Bank for International Settlements to have a positive effect on confidence, a foreshadowing of his emphasis at Bretton Woods on the importance of designing appropriate international monetary institutions. Keynes doubted that the Federal Reserve Board would reverse its cheap money policy "until business and employment in the United States is a great deal better than it is now." This emphasis on expectations would be characteristic of Keynes's *General Theory* (although equally in line with Irving Fisher's quantity theoretic concern with expected inflation), as is the measurement of the ease of monetary policy by the cheapness of money, that is, by low nominal interest rates. Because nominal interest rates (especially short-term rates such as the Treasury Bill rate) were very low in a period of deflation, the Federal Reserve Board continued to view monetary conditions as easy throughout what Milton Friedman and Anna Schwartz (1963) later termed the "Great Contraction" of the US money supply (during which the monetary base increased, but not by enough to offset the rise in currency/deposit and reserve/deposit ratios), despite Fisher drawing the attention of his former student, Federal Reserve Governor Eugene Meyer, to the statistics on the shrinkage of the money supply, the sum of currency and demand deposits (Cargill 1992, Dimand 2019).

On June 24, 1930, H. du Pré emphasized that, "In reply to your remarks about the character of your monthly letters, we assure you that we leave it entirely to you to judge in each case which are the topics which are most worth being discussed by you." Nonetheless, "There is one question upon which we particularly should like to have your opinion." Keynes's monthly letters had repeatedly stated that recovery depended on the bond market becoming more active, with new loans being used not just for the refunding of floating debt but for new productive investment. "But on the other hand these last months many articles in the economic press" saw excessive capacity in many industries; "in other words that the world has first to grow into a productive apparatus which is too big for immediate needs. If this should be true, can a renewed investment-activity soon be hoped for, and if it soon comes, would it really do good? Of course there would be less unemployment in a number of industries; but would not prices of consumptive commodities, and so cost of living, rise? And especially it might turn out after some time, that the new activity has only added to the – supposed – actual over-investment, so that the disequilibrium would only be greater. It may of course be that entirely new industries are going to take the lead, but we do not yet see any that are very likely to do so. We should be much obliged if you would solve this puzzle for us or at least give your views on the pretended overcapacity and its probable effects on future developments in your next letter." This letter sheds light on the audience for Keynes's reports in the secretariat of N. V. Philips: not just salesmen looking for tips about the market for radio sets in Great Britain or elsewhere, but thoughtful businessmen pondering sophisticated economic issues such as the dual nature of productive investment in creating demand while increasing capacity (a problem to which the warranted growth rate of Harrod 1939 was an attempted solution).

In his July 1930 letter (seven typed pages, plus a six-page note on the bond market), Keynes warned that "it is now fully clear the world is in the middle of an international cyclical depression of unusual severity … a depression and a crisis of major dimensions … I believe that the prevailing opinion in the United States is still not pessimistic enough and is relying too much on a recovery in the early autumn, an event which is, in my opinion, most improbable. Nothing is more difficult than to predict the date of recovery. But all previous experience would show that a depression on this scale is not something from which the recovery comes suddenly or quickly." He felt that "The optimism of Wall Street and the hoarding tendencies of France may prevent any real recovery of the International Loan Market this year" and considered whether this might lead to "a psychological atmosphere in which really drastic scientific measures will be taken by Great Britain and the United States in conjunction to do what is humanly possible to cause a turn of the tide next spring. But one is traveling here into the realm of the altogether uncertain and unpredictable." In contrast, the Harvard Economic Society (founded by Harvard economics professors Charles J. Bullock and Warren Persons) stated in its weekly letter on June 28, 1930, that "irregular and conflicting movements of business should soon give way to sustained recovery" and on July 19 that "untoward elements have operated to delay recovery but the evidence nevertheless points to substantial improvement" (quoted by Galbraith 1961, 150, see also Walter Friedman 2014).

Responding to du Pré's query, Keynes reiterated that recovery would be preceded by "a substantial fall in the long-period rate of interest … leading in due course to the recovery of investment." But now he explained that he was not thinking of investment in manufacturing industry, "the world's capacity for which is probably quite ample for the present." Even at the highest estimate, the total cost of bringing Britain's industrial plant up to date "would not use up the country's savings for more than, say, three months. Moreover, when expected profits are satisfactory the rate of expenditure by manufacturing industry in fixed plant is not very sensitive to the rate of interest."

"On the other hand," in contrast to manufacturing, "the borrowing requirements for building, transport and public utilities are not only on a far greater scale, but are decidedly sensitive to the rate of interest. If I were to put my finger on the prime trouble to-day, I should call attention to the very high rate of interest for long-term borrowers … the long-term rate of interest is higher to-day than it has been in time of peace for a very long time past. When, at the same time, there is a big business depression and prices are falling, it is not surprising that new enterprise is kept back at the present level of interest." He drew attention to "those who might be called distress borrowers, that is say countries which have an urgent need for borrowing to pay off existing debts, and are consequently ready to pay a very high rate of interest," citing prospective Austrian, Hungarian and Australian loans on the London bond market, and remarked that "the effect of the German Loan has been to supply the French Treasury with funds, which it has withdrawn from the French market and is keeping unemployed in the

Bank of France." Keynes's July 1930 letter (discussed briefly by Backhouse and Bateman 2011, 129) illuminates both his analysis of the present situation and the role of investment in his economics. His distinction between investment in manufacturing, responsive to expected profit rather than interest rates, and interest-sensitive investment in construction, transport and public utilities clarifies his theory of investment. Increased investment was crucial for recovery of the world economy, and low long-term interest rates were necessary for high levels of investment in construction, transport and public utilities, the largest part of investment (even if manufacturing investment depended more on expected profits). In regard to the current situation, Keynes explained the forces getting long-term interest rates high even when prices were falling and short-term interest rates were low, but felt that "progress has been made toward getting the necessitous borrowers out of the way." On the immediate practical level, Keynes's distinction between the determinants of the two categories of investment dealt with du Pré's question of how low long-term interest rates could stimulate investment given excess productive capacity in manufacturing. And yet, unlike Harrod (1939), Keynes's July 1930 letter did not come to grips with the theoretical point raised by du Pré, the dual character of investment in creating both demand and productive capacity.

Keynes's August 1930 letter dissented from the view widely held in the United States "even in responsible quarters, that we may expect an autumn recovery with some confidence … a good deal of the American optimism is based on analogies drawn from the date of recovery after the 1920-21 slump" (compare the Harvard Economic Society's statement on August 30 that "the present depression has about spent its force," quoted by Galbraith 1961, 150). He argued that "Too much emphasis cannot be laid on the really catastrophic character of the price falls of some of the principal raw materials since a year ago" (even larger than appeared from published index numbers, because those included a number of commodities subject to price controls), which "must profoundly affect the purchasing power of all overseas markets." Long-term interest rates remained high, reducing new capital investment. In contrast, Keynes considered general opinion about the British position to be "perhaps a little too pessimistic." Britain was already in a difficult position before the slump of 1929 and 1930, because of the 1925 return to the gold exchange standard at the prewar parity (over the eloquent protests of Keynes 1925). But the heavy unemployment in the slump was limited to textiles and heavy industry (iron and steel, coal, and shipbuilding), export-based sectors already hit by the return to gold at an overvalued exchange rate (in his December 1930 letter, Keynes stated that if textiles, iron and steel, and coal were omitted, there was practically no decline in the Index of Production from a year before and an improvement from two years before). Keynes explained that British unemployment statistics, when used in international comparisons, "probably overstate the case" since the British statistics included "a great many workers in definite employment, but working short time … It is even the case that workers taking their normal summer holidays are now included in the figures of the unemployed." According to *The Economist*, the aggregate profits of all British joint stock companies reporting their earnings in the first half of 1930 "were not only greater than in the previous year, but were larger than in any previous year. This was partly due to the prosperity of British Oil Companies operating abroad, but by no means wholly." Nor did Keynes share the worries of financial opinion in London (and so some extent his own previous letter to Philips) about "the constant dribble of gold to France."

In Keynes's September 1930 letter to Philips, he was "still of the opinion that real recovery is a long way off. But at the same time it seems to me not unlikely that we are at, or near, the lowest point … It is time, therefore, to cease to be a 'bear', even if it is not yet time to be a 'bull'." His February 1931 letter began, "Glancing through the letters of previous months, I find that they were all extremely pessimistic (with a brief lapse into modified optimism in September, corrected in October). Nevertheless, in the light of the actual course of events they were scarcely pessimistic enough. Nor do I see any reason for expecting any appreciable alleviation in the coming months." His September 1930 letter reported that "An extraordinary example of the way in which a situation can suddenly turn round, when a tendency has been greatly overdone, has been seen on the London Stock Exchange in the last two weeks. There has been no recovery of business in Great Britain to account for it. The real facts are much as they were a month ago. But market pessimism, aided by bear operations, had brought security prices down to an absurdly low level not justified by the circumstances … everyone knew in his heart that prices were falling to foolish levels. The result was that within a few days the prices of many leading securities had risen from 10 to 20 per cent." The stock market had diverged from any level that could be construed as reflecting underlying fundamentals, but then abruptly bounced back. Keynes again stressed that Britain was not doing as badly as the United States in the slump: the fall in the British index of production from the previous year "is certainly less than 10 per cent" whereas the US index of industrial production for July 1930 was 37% below that for July 1929.

Keynes's 1930 "October Letter" warned that, "The catastrophic increase in the value of money has raised the burden of indebtedness of many countries beyond what they can bear … in many parts of the world the fall of prices has now reached a point where it is straining the social system at its foundations. Agriculturists and other producers of primary materials are being threatened with ruin and bankruptcy all over the world. It is useless to expect a recovery of markets in such conditions" (and in his February 1931 letter he again warned that "The prospect of a long series of defaults [by debtor countries exporting raw materials] during 1931 is not be excluded"). All of the gains that Germany had received in the Young Plan for reparations compared to the Dawes Plan were obliterated because "the clause in the Dawes Plan by which her [Germany's] liabilities in terms of gold were to be modified in the event of a change in prices was not included in the Young Plan." Keynes declared himself "rather more pessimistic … than a month ago." He remarked that in Britain, "Very slight steps have been taken, as yet, in the direction of reducing wages, which is probably inevitable, but will not get anyone much further if all countries alike embark on wage-cutting policies."

These themes of Keynes's October 1930 letter to Philips, the danger of ruin and bankruptcy from price deflation in a world where debts are fixed in money terms and the futility of wage-cutting, appeared publically in his December article in *The Nation and Atheneum* on "The Great Slump of 1930" (reprinted in his *Essays in Persuasion*, 1931). There Keynes (1931, 138–139) warned that, since wage and price deflation increases the real burden of debt and wage cuts reduce purchasing power, "neither the restriction of output nor the reduction of wages serves in itself to restore equilibrium" and went on to emphasize that "Moreover, even if we were to succeed eventually in reestablishing output at the lower level of money-wages appropriate to (say) the pre-war level of prices, our troubles would not be at an end. For since 1914 an immense burden of bonded debt, both national and international, has been contracted, which is fixed in terms of money. Thus every fall of prices increases the value of the money in which it is fixed. For example, if we were to settle down to the pre-war level of prices, the British National Debt would be nearly 40% greater than it was in 1924 and double what it was in 1920; … the obligations of such debtor countries as those of South America and Australia would become insupportable without a reduction of their standard of life for the benefit of their creditors; agriculturalists and householders throughout the world, who have borrowed o mortgage, would find themselves the victims of their creditors. In such a situation it must be doubtful whether the necessary adjustments could be made in time to prevent a series of bankruptcies, defaults, and repudiations which would shake the capitalist order to its foundations" (see also Dimand 2011). Here, before Fisher (1932, 1933, see Dimand 2019), was the concern with the effect of deflation on the real value of nominal deflation that reappeared in Chapter 19, "Changes in Money Wages," of *The General Theory*, where Keynes (1936, 264) warned that "if the fall of wages and prices goes far, the embarrassment of those entrepreneurs who are heavily indebted may soon reach the point of insolvency – with severely adverse effects on investment."

Contested Budgets, Trade Balance and the Banking and Exchange Crises of 1931

In 1930, Keynes's "November Letter" argued that foreign opinion underestimated the financial strength that accompanied Britain's industrial weakness: "it is forgotten that the adverse tendencies of the foreign exchanges, until recently, have been due, not to the absence of a favorable foreign trade balance, but to the eagerness of British investors to take advantage of the high profits or high rates of interest obtainable abroad. In 1929 the British favorable balance available for new foreign investment was greater than that for any other country, greater even than that for the United States. The Bank of England's difficulties were due to the fact that the pressure of savers to take advantage of opportunities abroad was even greater." Subsequent events in Wall Street and elsewhere had made overseas investment less appealing to British savers, so that the Bank of England was holding twenty million pounds sterling more of gold than a year before. In his December 1930 letter, Keynes reported that, even though "The perpetual drain of gold to France provides a source of nervousness and irritation in the money market" and although thirty million pounds sterling of gold had moved from Britain to France in the previous three months, the Bank of England held twenty-two million pounds sterling more in gold than a year before (but Keynes's March 1931 letter reported that a drain of twenty million pounds sterling of gold from the Bank of England in the previous three months "causing nervous talk to prevail in London"). Despite Keynes's repeated insistence on the financial strength of sterling and the growing gold reserves of the Bank of England (less than a year before the crisis of August and September 1931 that forced Britain off the gold exchange standard), the underlying message was that capital mobility under fixed exchange rates would constrain even the Bank of England from trying to lower long-term interest rates to stimulate investment. Until Britain left the gold standard and allowed sterling to float, Keynes's letters to Philips monitored the strength of protectionist sentiment in the British Government, but he lost interest in tariff proposals once the exchange rate was no longer pegged (see Keynes 1931). But there was one bright spot for Britain: Keynes's February 1931 letter stressed that "It must not be overlooked that England is gaining enormously by the tremendous drop in the price of her imports as compared with that of her exports."

Keynes's April 1931 letter to Philips is notable for explaining that Britain's apparent budget deficit of £23.5 million for the fiscal year ending March 31 "is not as bad as it sounds, since this figure is reached after allowing for the repayment of £67,000,000 of debt. So that, apart from debt repayments, there was a surplus on the year's workings of £43,500,000. It must be doubtful whether any other country is showing so favorable a result. Even if the sum borrowed for the unemployment fund, which lies outside the budget[5], were to be deducted, there would still have on the year a net reduction of debt." The next year's was expected to be larger, but "If no debt were to be repaid, there would probably be no deficit, even for the forthcoming year." Keynes's May 1931 letter, reporting on the budget presented by Labor Chancellor of the Exchequer Phillip Snowden, noted that "there will still be some reduction of debt during the forthcoming year, though not on as large as a scale as formerly." A few months later, when Snowden and Prime Minister Ramsay MacDonald broke with their party to join the Conservatives in a National Government to deal with a budget and exchange crisis, Snowden found it convenient to overlook that the apparent budget deficit was an artifact of budgeting for a reduction in the national debt, and to denounce his former Labor Cabinet colleagues for endangering the savings of small depositors by having the Post Office Savings Bank lend to the Unemployment Insurance Fund, without mentioned that such loans were guaranteed by the Treasury or that he had neglected to inform his Cabinet colleagues of the borrowing (as Keynes indignantly explained in two paragraphs in the draft of his November 1931 letter, deleted from the final version).

Keynes's May 1931 letter is also notable, in light of the subsequent exchange crisis that forced Britain off gold in September, for insisting that "The improvement in the sterling exchanges and the better gold position of the Bank of England, as it appears in the public returns, are not deceptive and may be assessed at even more than their face value." He held that "When there is no longer serious pressure on the Bank of England's gold, the stage will be set for really cheap money throughout the world … It will not mean a recovery, but it will pave the way for the recovery of investment which must precede the recovery of prices and profits." Keynes again emphasized that "the fall in the prices of the commodities imported by Great Britain has been so much greater than the fall in the prices of her exports. On the visible trade balance Great Britain was £5,000,000 better off in the first quarter of 1931 than in either of the preceding years … Thus the main burden of the present crisis falls on the raw-material-producing countries, and Great Britain is likely to gain gold in spite of the immense decline of her exports."

By the next month, as the Credit-Anstalt collapsed in Vienna (see Schubert 1991), as French and American capital then took flight from Germany (see Balderston 1994), and as share prices slumped in London, Wall Street and on most European bourses, Keynes felt "that we are now entering the crisis, or panic, phase of the slump. I am inclined to think that we look back on this particular slump we shall feel that this phase has been reached in the summer months of 1931, rather than at any earlier date." He warned that "the consequences of a change in the value of money, as reflected in the prices of leading commodities, so violent as that which has occurred in the last eighteen months, cannot be regarded too gravely. Until prices show a material rise the whole fabric of economic society will be shaken. Each decline of commodity prices and each further collapse on the Stock Exchanges of the world brings a further group of individuals or institutions into a position where their assets doubtfully exceed their liabilities."

Looking across the Atlantic: The American Slump

Keynes's July 1931 letter focused on the United States, where 21% of the industrial population was unemployed with perhaps another 20% working only two or three days a week: "it is quite out of the question that there should be anything which could be called a true recovery of trade at any time within, say, the next nine months. The necessary foundations for such a recover simply do not exist." Many of the loans of small banks to farmers or secured by real estate "are non-liquid and probably impaired. Thus there is a strong desire for the utmost liquidity while obtainable on the part of the ordinary Bank; and general unwillingness to take any unnecessary risks or to embark on speculative enterprise, even where the risk may be actuarially a sound one. The nervousness on the part of the Bankers is accompanied by a nervousness of the part of their depositors … So there is quite a common tendency to withdraw money from the banks and keep resources hoarded in actual cash … It was estimated that in the country as a whole as much as $500,000,000 was hoarded in actual cash in this way" (see Fisher 1933, Friedman and Schwartz 1963, Bernanke 2000). Keynes stressed that, "The American financial structure is more able than the financial structure of the European countries to support the strain of so great a change in the value of money. The very great development of Bank deposit and of bondage indebtedness in the United States means that a money contract has been interposed between the real estate on the one hand and the ultimate owner of the wealth on the other. The depreciation in the money value of the real estate sufficient to cause margins to run off, necessarily tends therefore to threaten the solidity of the structure."

Keynes reported in his July 1931 letter that although US agricultural wages had fallen by 20 to 25%, and there had also been large cuts to wages in small-scale industrial enterprises, hourly wages were practically unchanged for two thirds of the workers in large-scale industrial enterprises while the hourly wages of the other third had been reduced by some 10%. In October 1934, however, Keynes stated in his Cambridge lectures that "Labor will and has accepted reductions in money wages, in the USA in 1932, and it will not serve to reduce unemployment" with one student's notes calling the money-wage reductions "catastrophic" (Rymes 1987, 131).

Germany Defaults, Britain Abandons the Gold Parity

Turning from the United States, Keynes remarked near the end of his July letter that, "At the moment of writing there are heavy gold drains from London; but I do not think that this need be regarded with any undue alarm," a judgment that proved too sanguine.

More presciently, he added “The real danger in the situation comes from the possibility of the declaration of a general moratorium in Germany and the collapse of the mark [Germany defaulted on July 15]. The repercussion of such events on the solvency of the banking and money market systems of the world would be most serious.” The next month, in his August 1931 newsletter (dated August 4), Keynes reported that “the bulk of the remaining short-term German debt is due to British and American banks and accepting houses; many accepting houses being landed with what are certainly frozen and may prove doubtful debts. Their own credit has suffered with the inevitable result, since they were the holders of large foreign balances, of a drain of gold from London … it would seem to be only ordinary prudence to act on the assumption that, while worse developments in Germany are doubtless possible, even apart from this the general underlying position is worse than the ordinary reader of newspapers believes it to be.” While “Great Britain is suffering from the temporary shock to confidence due to the difficulties of the accepting houses,”[6] the situation of the world economy as a whole was more serious: “We are certainly standing in the midst of the greatest economic crisis of the modern world. Important though the German developments have been I would emphasize that these have been essentially consequences of deeper causes which are affecting all countries alike … For there is no financial structure which can withstand the strain of so violent a disturbance of values.” A handwritten postscript at the end of the typed August 1931 letter warns Keynes’s readers “not to be encouraged even by the appearance of apparently good news. The world financial structure is shaken and is rotten in many directions. Patching arrangements will be attempted, but they will not do much good, and it would be a mistake to place reliance on them.” The next day, August 5, Keynes, writing to Prime Minister J. Ramsay MacDonald to urge rejection of the May Report, stated that “it is now virtually *certain* that we shall go off the existing parity at no distant date … when doubts, as to the prosperity of a currency, such as now exist about sterling, have come into existence, the game’s up” (Keynes 1971–1989, Vol. XX, 591–593; Skidelsky 2003, 446), but he did not say so in print or to Philips – and he rejected, on patriotic grounds, a suggestion by O. T. Falk that the Independent Investment Trust, of which Keynes and Falk were directors, should replace a dollar loan with a sterling loan, which Keynes condemned as “a frank bear speculation against sterling.” The Independent Investment Trust lost £40,000 by not switching its financing (Keynes 1971–1989, Vol. XX, 611–612; Moggridge 1992, 528–529; Skidelsky 2003, 447).

It was not only the world financial structure that was shaken; so was the Secretary Department of N. V. Philips. On August 6, 1931, H. du Pré wrote plaintively to Keynes, “Though we could hardly expect otherwise from your former letters, we note that you are not at all optimistic about the developments in the latter part of this year. These last weeks we read in the papers some statements from several Americans (among them people of authority), which hold a somewhat more cheerful view for the coming months. Must we infer from your letter that they are still, or again, too optimistic or is it possible that since your return from America[7] there have been some improvements, which may lead one to expect some improvement at least for the autumn?” Even Roger Babson, who had made his reputation by being bearish about the stock market in September 1929 (as he had been since 1926), was bullish by early 1931 (see W. Friedman 2014).

Keynes's reply on August 12 crushed any hopes: "In response to your enquiry, nothing has happened to make me more optimistic. As regards America, I consider that recovery this autumn is altogether out of the question. But the minds of all of us are of course dominated by the European and indeed the world situation. This still seems to me to be, as I have already described it, more serious than the general public know. I should recommend as complete inaction as is possible until further crises, or further striking events of some kind or another have occurred to clear up the situation."

Keynes's September letter (dated September 10, 1931), after the Conservative-dominated National Government displaced Labor, warned that "the hysterical concentration on Budgeting economy, which has also spread to the curtailment of expenditure by Local Authorities is calculated to produce unfavorable developments. For the widespread curtailment of expenditure is certain to reduce business profits and increase unemployment and lower the receipts of the Treasury, whilst it will do very little to tackle what is the fundamental problem, namely the improvement of the British Trade Balance. We seem likely to be faced by a period during which the balance of trade will not be sufficient to give confidence to foreign depositors."

It turned out, however, that one part of the cuts in government spending, the reduction in pay of the armed services, did indirectly dispose of the balance of payments problem. Since the government's version of equal sacrifice was that a vice-admiral earning £5 10s a day would lose 10 shillings a day (a reduction of 1/11), while naval lieutenants earning £1 7s a day and able-bodied seamen earning 5 shillings a day should each lose a shilling a day, reductions of 1/27 and 1/5, respectively (Muggeridge 1940, 109n), a naval mutiny erupted at Invergordon on September 16 (the first British naval mutiny since 1797), leading to abandonment of a fixed exchange rate on September 21 and a prompt 20% depreciation of sterling. Once the gold parity was abandoned, interest rates could be lowered without any balance of payments crisis. Commander Stephen King-Hall remarked "the strange combination of circumstances which caused the Royal Navy to be used by a far-seeing Providence as the unconscious means of … releasing the nation from the onerous terms of the contract of 1925 when the pound was restored to gold at pre-war parity … In 1805 the Navy saved the nation at Trafalgar; it may be that at Invergordon it achieved a like feat" (quoted by Muggeridge 1940, 111n). As for the budget deficit, Chancellor Snowden, who in the preceding Labor government had steadfastly blocked any reduction in the Sinking Fund contributions for paying down the national debt, now presented a budget reducing the annual Sinking Fund contribution by £20 million. Keynes declared in his October 1931 letter to Philips, "Great Britain's inevitable departure from the gold standard having occurred, it has been received with almost universal relief and in industrial circles a spirit of optimism is now abroad … Since the City and the Bank of England did their utmost to avoid the change, they feel that honor is satisfied. In other quarters the effect is to relieve a tension which was becoming almost unbearable … I have no doubt at all as to the reality of the stimulus which British business has obtained." Fisher (1935), assembling data on twenty-nine countries, found that recovery began only once a country abandoned the gold parity and was able to pursue a looser monetary policy (see Dimand 2003).

Keynes concluded his October 1931 letter, "The general passion for liquidity is bringing the value of cash in terms of everything else to so high a level as to be very near breaking point. This does not apply to Great Britain since her crisis was a balance of payments crisis rather than a banking crisis strictly so called. Thus the possibility of a general European and American banking crisis is the main risk, the possibility of which has now to be borne in mind." The US banking crisis culminated in the "Bank Holiday" of March 1933, while all the major German and Italian banks passed into government ownership.

On November 3, 1931, Dr. du Pré was "very sorry to say that the necessity for the strictest economy which makes itself felt in all departments of our concern at present, impels us to an important curtailment of the budget of our Economic Intelligence Service" which would now issue bulletins every three months, instead of monthly. He asked Keynes for quarterly letters for £50 per annum, instead of monthly letters for £150 per annum. Keynes replied on November 9 that he read the letter "without any great surprise. I had been rather hesitating in my mind as to whether it is worth while to continue the arrangement on the new basis. But on the whole I feel that I should not like to break the friendly relations which have arisen between us, merely because times are bad." He accepted the offer[8], asking to be reminded when each quarterly report was due, and enclosed his November letter stating that Britain was "to a considerable extent getting the best of both worlds since broadly speaking the countries from which we buy our food and raw materials have followed us off gold, whilst our manufacturing competitors have remained on the old gold parity."[9] He felt that Continental observers were mistaken to think that Britain would want to return to gold: "Foreigners always underestimate the slow infiltration of what I have sometimes called 'inside opinion', whilst 'outside opinion' remains ostensibly unchanged. Then quite suddenly what 'inside opinion' becomes 'outside opinion'. Foreigners are quite taken by surprise, but the change is really one which had been long prepared. In the later months of the old gold standard there was a hardly a soul in this country who really believed in it. But it was considered that it was our duty for fairly obvious reasons to do everything we possibly could to keep where we were."

Keynes's May 1932 quarterly letter stressed that, "The most important development, if one is thinking not so much of the moment but of laying the foundations for future improvement, is to be found in the return to cheap money, which was interrupted by the financial crisis of last summer and the departure from gold. I am more and more convinced in the belief, which I have held for some time, that an ultra-cheap money phase in the principal financial centers is an indispensable preliminary to recovery … Nevertheless it would be imprudent to expect too much at any early date from the stimulus of cheap money. The courage of enterprise is now so completely broken, that the effect on prices of money however cheap will be very slow. I consider it likely, therefore, that the cheap money phase may be extremely prolonged and that it may proceed to unprecedented lengths before it produces its effect." He concluded, "For the time being the world is marking time, – waiting for it does not quite know what. I emphasize again the fact that the position in Great Britain, and in some of her Dominions, is relatively good. But for the time being, I see no light anywhere else … It would certainly be much too soon to take any steps whatever to be ready for a possible revival."

Looking across the Atlantic: Hope from the New Deal

Keynes's August 1932 memorandum was notable for its explanation of why US stock prices had risen sharply and why that need not signal an end to the industrial crisis: the financial crisis had driven down stock prices until "the securities of many famous and successful companies were standing at little more than the equivalent of the net cash and liquid resources owned by those companies … the assets in question would either be worth nothing as a result of the general breakdown of contract, or must, in any circumstances apart from that, be worth a very great deal more than their quotations. Consequently, it is logical and right that the fear of their being worth nothing having been brought to an end, there should be a rapid recovery of the quotations on a very striking scale. It does not need a termination of the industrial crisis, or even an expectation of its early cessation, in order to justify the new levels."

In his February 1933 memorandum, commenting on the likely futility of the projected World Economic Conference, Keynes recalled that "I have myself put forward more drastic proposals for an international fiduciary currency, which would be the legal equivalent of gold. If this were agreed to, the position would be so much eased that various other desirable measures would also become practicable. I do not despair of converting British opinion to such a plan, but I am told that continental opinion would be almost unanimously opposed it." Keynes had contemplated such proposals long before Bretton Woods.

Keynes's August 1933 memorandum (actually mailed July 20, before Keynes left for holidays) held that "My own view is that President's Roosevelt's programme is to be taken most seriously as a means not only of American, but of world recovery. He will suffer set-backs and no one can predict the end of the story. But it does seem fairly safe to say that his drastic policies have had the result of turning the tide in the direction of better security not only in the United States, but elsewhere … Perhaps in the end President Roosevelt will devalue the dollar in terms of gold by 30 or 40 per cent." His November 1933 memorandum regretted "the failure of the President during his first six months to act inflation as well as talk it. In actual fact Governmental loan expenditure in the United States up to the end of September was on quite a trifling scale" but since then it seemed to be increasing: "if during the next six months the President is at last successful in putting into circulation a large volume of loan expenditure, I should expect a correspondingly rapid improvement in the industrial prosperity of America. This, if it occurs, would have a great influence on the rest of the world and especially on Great Britain … it might pave the way for a rate of improvement sufficiently rapid to deserve the name of real recovery." Keynes's February 1934 memorandum reported that in the United States "everything is moving strongly upwards. This is to be largely attributed to the fact that Governmental loan expenditure is now at last occurring on a large scale … the disbursement by the American Treasury of new money against borrowing has reached or is approaching $50,000,000 weekly and should maintain this rate for a few months to come." In his August 1934 memorandum, having visited the United States since his May memorandum, he found there "a recession which is somewhat more than seasonal," aggravated since his visit by a "failure of the corn crop … so acute as to be little short of a national disaster" but the actual and prospective level of US Government loan-financed expenditure made him optimistic about prospects for the US economy in the autumn and winter. He also reported that "the view is generally held in Great Britain that the gold block countries – including Holland not less than the others – cannot permanently maintain their present parity with gold without a disaster. Now or later it seems to us certain that the necessity for devaluation will be admitted." The reports end with Keynes's November 1934 memorandum, with no correspondence in the Keynes Papers concerning the end of his relationship with the Philips firm.

Conclusion: The Message of Keynes's Reports to Philips

Keynes's letters to the Philips electronics firm reveal he perceived events in the British and world economies from the beginning of 1930 through November 1934, and provide pungent and insightful commentary. These reports high-light the importance to Keynes of cheap money as a stimulus to investment – he was not just concerned with fiscal policy as the means to recovery, however much he placed emphasis from 1933 onward on the loan-financed expenditure of the Roosevelt Administration in the US. Keynes's response to a query from du Pré is particularly interesting about Keynes's distinction between those investment expenditures that are sensitive to interest rates and those that are not. The reports stress a theme discussed more briefly in Keynes's 1931 Harris Foundation lectures in Chicago (in Wright, ed., 1931) and in Chapter 19 of *The General Theory*, and at greater length by Irving Fisher (1932, 1933) (and later by Hyman Minsky 1975): since debt are contracted in nominal terms, a rise in the purchasing power of money increases the risk of bankruptcy, repudiation and default – and it is not just actual defaults that are costly, but also the perception of increased riskiness. Keynes recognized the exceptional seriousness of the Depression, dissenting firmly from predictions of an early recovery, and he saw clearly how defending overvalued gold parities forced central banks to keep interest rates high, instead of pursuing ultra-cheap money to restore investment. This hitherto-neglected body of evidence allows one to watch the unfolding of the world economic crisis of the early 1930s through Keynes's eyes, extraordinary events as viewed and narrated by an extraordinary economist. At £12 10s per report (by no means a trivial sum at the time), N. V. Philips certainly got their money's worth.

Notes

1. "Thursday, October 24, is the first of the days which history – such as it is on the subject – identifies with the panic of 1929" (Galbraith 1961, 103–104), but already on Monday, October 21, Irving Fisher had characterized the fall in stock prices as just the "shaking out of the lunatic fringe" and on Tuesday, Charles Mitchell of the National City Bank declared that "the decline has gone too far" (Galbraith 1961, 102).
2. Philips Incandescent Lamp Works, later Philips Electronics, successor to a firm founded by Lion Philips (originally Presburg), maternal uncle of Karl Marx (Gabriel 2011, 44, 110, 291-93, 295, 299, 315, 334, 366). Although relations between uncle and nephew were "strained by politics" (Gabriel 2011, 291), Mary Gabriel (2011, 299) refers to Marx's "fund of last resort, his uncle … He had sold himself to this pragmatic businessman as a successful writer only temporarily short of cash." Gabriel (2011, 642) remarks that "Marx's dabbling in the stock market has been questioned by some scholars, who believe he may simply have wanted his uncle to believe he was engaged in 'capital' transactions, not *Capital*." After the death of Lion

Philips, his sons did not reply to Marx's letter asking for help with his daughter Laura's wedding (Gabriel 2011, 364). Anthony Sampson (1968, 95) reported that the firm's chairman Frits Philips was "a keen Moral Rearmer and a fervent anti-communist, embarrassed by the fact that his grandfather was a cousin of Karl Marx."

3. For a sense of what £150 a year might have meant to Keynes: Moggridge (1992, 508, 585) and Skidelsky (2003, 417–418, 519, 565) report that Keynes's net worth fluctuated from £44,000 at the end of 1927 to £7,815 at the end of 1929, then rising to over £506,222 at the end of 1936, dropping again to £181,244 at the end of 1938. The offer from Philips came at a particularly low point in his finances. According to Skidelsky (2003, 265) "investment, directorship and consultancy income" accounted for more than 70% of Keynes's income between 1923-24 and 1928-29 (including £1,000 a year as chairman of National Mutual Life Assurance), books and articles for another 20%, leaving no more than a tenth of income from such academic sources as teaching, examining, being secretary of the Royal Economic Society and editor of its journal, and being Bursar and a Fellow of King's College.
4. However, writing to Keynes on January 21, H. du Pré was moved "to remark that the latest figures from the Argentine which, according to the handwritten note at the bottom of your letter, you intended to enclose, were not received here, so that we cannot give you an opinion about their importance for us."
5. When the majority report of the May Committee on National Expenditure projected on July 31, 1931, that the budget deficit for 1931-32 would be £120 million, necessitating £96 million of cuts to unemployment benefits, road construction, and government and armed forces pay, it counted all borrowing by the Unemployment and Road funds as "public expenditure on current account" as well as "the usual provision for the redemption of debt" of £50 million (Winch 1969, 126–130). Keynes accused the majority on the May Committee of not "having given a moment's thought to the possible repercussions of their programme, either on the volume of unemployment or on the receipts of taxation" – he estimated it would add 250,000 to 400,000 to the unemployed, and reduce tax receipts by £70 million (*New Statesman and Nation*, August 15, 1931; Keynes 1971-89, Vol. IX, 141–145; Winch 1969, 130, Skidelsky 2003, 446).
6. With regard to Britain, Keynes noted that "There is, however, tremendous pressure of public opinion towards the Government Economy, which means in the main a reduction in the salaries of Government employees and of the allowances of the unemployed. It is equally difficult for the present [Labour] Government either to refuse or concede concessions to this trend of opinion. But if a movement in this direction takes place, which is still most doubtful, it remains exceedingly open to argument whether the result on the actual level of unemployment will be favourable."
7. Keynes had given three Harris Foundation Lectures on "An Economic Analysis of Unemployment" at the University of Chicago in June and July 1931, published in Quincy Wright, ed. (1931), and reprinted in Keynes (1971-89), Vol. XIII. These lectures mostly expounded the analysis of Keynes's *Treatise*, but the third lecture also examined the debt-deflation process, the undermining of the financial structure by an increase in the real value of debts and fall in the nominal value of collateral (Keynes 1971-89, Vol. XIII, 359–361, see Dimand 2011).
8. He also raised a "small personal matter", asking for advice on buying a new wireless set that would "have a thoroughly good loud speaker, both for voice and music reproduction and should be able to pick up distant stations such as Moscow."
9. A passage crossed-out in the draft of Keynes's November 1931 letter, in the section discussing the general election, stated that, "As has been the case in the last three or four General Elections, it is that old wretch Lord Rothermere [publisher of the *Daily Mail*] who has been dead right. It is said that he has made a profit on the crisis of £100,000, buying majorities on the Stock Exchange." Skidelsky (2003, 472) relates that Keynes "consistently lost money (his own and his friends') on the results of general elections."

References

Backhouse, Roger E., and Bradley W. Bateman, eds. 2006. *The Cambridge Companion to Keynes*. Cambridge, UK: Cambridge University Press.

Backhouse, Roger E., and Bradley W. Bateman. 2011. *Capitalist Revolutionary: John Maynard Keynes*. Cambridge, MA: Harvard University Press.

Balderston, Theo. 1994. "The Banks and the Gold Standard in the German Financial Crisis of 1931." *Financial History Review* 1 (1):43–68. https://doi.org/10.1017/S0968565000001554

Bernanke, Ben S. 2000. *Essays on the Great Depression*. Princeton, NJ: Princeton University Press.

Cargill, Thomas F. 1992. "Miscellany: Irving Fisher Comments on Benjamin Strong and the Federal Reserve in the 1930s." *Journal of Political Economy* 100 (6):1273–7. https://doi.org/10.1086/261861

Chadwyck-Healey. 1993. *The John Maynard Keynes Papers in King's College, Cambridge, 170 Reels of Microfilm*. Cambridge, UK: Chadwyck-Healey Ltd.

Cox, Jacqueline. 1993. *A Catalogue of the John Maynard Keynes Papers in King's College, Cambridge*. Cambridge, UK: Chadwyck-Healey Ltd.

Cox, Jacqueline. 1995. "Keynes: An Archivist's View." In *New Perspectives on Keynes,* Annual Supplement to History of Political Economy. Vol. 27, edited by Allin F. Cottrell and Michael S. Lawlor, 163–75. Durham, NC: Duke University Press.

Dimand, Robert W. 1988. *The Origins of the Keynesian Revolution*. Aldershot, UK: Edward Elgar Publishing.

Dimand, Robert W. 2003. "Irving Fisher on the International Transmission of Booms and Depressions through Monetary Standards." *Journal of Money, Credit and Banking* 35 (1):49–90. https://doi.org/10.1353/mcb.2003.0002

Dimand, Robert W. 2011. "The Consequences to the Banks of the Collapse of Money Values,' 1931 and 2009." In *Perspectives on Keynesian Economics*, edited by Arie Arnon, Jimmy Weinblatt, and Warren Young, 233–45. Heidelberg: Springer Verlag.

Dimand, Robert W. 2019. *Irving Fisher*. London: Palgrave Macmillan, Great Thinkers in Economics.

Dimand, Robert W., and Harald Hagemann, eds. 2019. *The Elgar Companion to John Maynard Keynes*. Cheltenham, UK.

Fisher, Irving. 1932. *Booms and Depressions*. New York: Adelphi.

Fisher, Irving. 1933. "The Debt-Deflation Theory of Great Depressions." *Econometrica* 1 (4):337–57. https://doi.org/10.2307/1907327

Fisher, Irving. 1935. "Are Booms and Depressions Transmitted Internationally through Monetary Standards?" *Bulletin de L'Institut Internationale de Statistique* 28 (1):1–29. Reprinted in Dimand (2003).

Friedman, Milton, and Anna J. Schwartz. 1963. *A Monetary History of the United States, 1867–1960*. Princeton, NJ: Princeton University Press for the National Bureau of Economic Research.

Friedman, Walter A. 2014. *Fortune Tellers: The Story of America's First Economic Forecasters*. Princeton, NJ: Princeton University Press.

Gabriel, Mary. 2011. *Love and Capital: Karl and Jenny Marx and the Birth of a Revolution*. New York: Little, Brown.

Galbraith, John Kenneth. 1961. *The Great Crash 1929, with New Introduction*. Boston, MA: Houghton Mifflin.

Harrod, Roy F. 1939. "An Essay in Dynamic Theory." *The Economic Journal* 49 (193):14–33. https://doi.org/10.2307/2225181

Keynes, John Maynard. 1983 [1923]. "Some Aspects of Commodity Markets." *Manchester Guardian Commercial, Reconstruction in Europe* 29 March 1923; reprinted in Keynes (1971–89), XII:255–66.

Keynes, John Maynard. 1983 [1923–30]. *London and Cambridge Economic Service Special Memoranda*, as reprinted in Keynes (1971–89), XII: 267–647.

Keynes, John Maynard. 1919. *The Economic Consequences of the Peace*. London: Macmillan.

Keynes, John Maynard. 1925. *The Economic Consequences of Mr. Churchill*. London: Leonard and Virginia Woolf, at the Hogarth Press.
Keynes, John Maynard. 1930. *A Treatise on Money*, 2 Volumes. London: Macmillan.
Keynes, John Maynard. 1931. *Essays in Persuasion*. London: Macmillan.
Keynes, John Maynard. 1936. *The General Theory of Employment, Interest and Money*. London: Macmillan.
Keynes, John Maynard. 1971–89. *The Collected Writings of John Maynard Keynes*, 30 volumes, general editors Donald E. Moggridge and E. A. G. Robinson, volume editors Elizabeth S. Johnson and Donald E. Moggridge. London: Cambridge University Press, for the Royal Economic Society.
Minsky, Hyman P. 1975. *John Maynard Keynes*. New York: Columbia University Press.
Moggridge, Donald E. 1992. *Maynard Keynes: An Economist's Biography*. London: Routledge.
Moggridge, Donald E. 2006. "Keynes and His Correspondence." In *The Cambridge Companion to Keynes*, edited by Roger E. Backhouse and Bradley W. Bateman, 136–59. Cambridge, UK: Cambridge University Press.
Muggeridge, Malcolm. 1940. *The Thirties: 1930-40 in Great Britain*. London: Hamish Hamilton.
Rymes, Thomas K., ed. 1987. *Keynes's Lectures: Notes of Students*. Ottawa: Department of Economics, Carleton University.
Rymes, Thomas K., ed. 1989. *Keynes's Lectures, 1932–35: Notes of a Representative Student*. London: University of Michigan Press.
Sampson, Anthony. 1968. *The New Europeans*. London: Hodder and Stoughton.
Schubert, A. 1991. *The Credit-Anstalt Crisis of 1931*. Cambridge, UK: Cambridge University Press.
Skidelsky, Robert. 1983–2000. *John Maynard Keynes*, 3 volumes. London: Viking.
Skidelsky, Robert. 2003. *John Maynard Keynes, 1883-1946: Economist, Philosopher, Statesman*. London: Macmillan.
Winch, Donald. 1969. *Economics and Policy: A Historical Study*. New York: Walker and Company.
Wright, Quincy, ed. 1931. *Unemployment as a World Problem: The Harris Foundation Lectures*. Chicago, IL: University of Chicago Press.

Common Ownership, Competition, and Top Management Incentives

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We present a mechanism based on managerial incentives through which common ownership affects product market outcomes. Firm-level variation in common ownership causes variation in managerial incentives and productivity across firms, which leads to intraindustry and intrafirm cross-market variation in prices, output, markups, and market shares that is consistent with empirical evidence. The organizational structure of multiproduct firms and the passivity of common owners determine whether higher prices under common ownership result from higher costs or from higher markups. Using panel regressions and a difference-in-differences design, we document that managerial incentives are less performance sensitive in firms with more common ownership.

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> Areas of research that I, as an antitrust enforcer, would like to see developed before shifting policy on common ownership [are]: Whether a clear mechanism of harm can be identified. (Federal Trade Commission [FTC] Commissioner Noah J. Phillips, FTC Hearing on Common Ownership, December 6, 2018)

> The organizational complexity of today's largest public companies makes it far from clear how—even if top managers receive an anticompetitive signal from their pay packages—those incentives affect those making pricing decisions throughout the organization. . . . For these reasons, I worry that the evidence we have today may not carry the heavy burden that, as a Commissioner sworn to protect investors, I would require to impose costly limitations. (Securities and Exchange Commission [SEC] Commissioner Robert J. Jackson, FTC Hearing on Common Ownership, December 6, 2018)

Caliendo, Naibin Chen, Chris Conlon, Judith Chevalier, Vicente Cuñat, Jan De Loecker, Peter DeMarzo, Wouter Dessein, Alex Edmans, Daniel Ferreira, Vyacheslav Fos, Xavier Gabaix, Xavier Giroud, Will Goetzmann, Paul Goldsmith-Pinkham, Todd Gormley, Gary Gorton, Jillian Grennan, Phil Haile, Sabrina Howell, Robert Jensen, Jay Kahn, Lisa Kahn, Al Klevorick, Augustin Landier, Song Ma, Gregor Matvos, Meg Meyer, Holger Mueller, Kevin Murphy, Barry Nalebuff, Martin Oehmke, Michael Ostrovsky, Paul Oyer, Paul Pfleiderer, Thomas Philippon, Michael Raith, Raffaella Sadun, Fiona Scott Morton, Kelly Shue, Mike Sinkinson, Jeremy Stein, Chad Syverson, Eric Talley, John Van Reenen, Jidong Zhou, Josef Zechner, Anthony Zhang, Luigi Zingales, and seminar participants at Humboldt University of Berlin; Bocconi University; the University of Bonn; Boston University; the University of Cambridge; Case Western Reserve University; Cass Business School; the University of Cologne; Columbia University; Dartmouth College; Global Corporate Governance Colloquia Tokyo and Stockholm; the European Winter Finance Summit; the Federal Reserve Bank of San Francisco; Georgetown University; Haverford College; Harvard Business School; Hong Kong University of Science and Technology; the International Industrial Organization Conference; London Business School; National Bureau of Economic Research; Norges Bank Investment Management; Norwegian School of Economics; Northwestern University; the University of Notre Dame; the University of Michigan; the University of Oslo; Oslo Metropolitan University; the University of Oxford; Simon Fraser University; the University of British Columbia; the University of California, Los Angeles; the University of California, San Diego; the University of Southern California; the University of Utah; the Western Finance Association; Washington University in St. Louis CFC; Vienna University of Economics and Business; and Yale University for helpful comments. We are grateful to Andreas Klümper, Weicheng Min, Regina Seibel, and Nathan Shekita for outstanding research assistance. We acknowledge financial support from the Department of Economy and Knowledge of the Generalitat de Catalunya (2014 SGR 1496); the Ministry of Science, Innovation, and Universities (PGC2018-097335-A-I00); the Deutsche Forschungsgemeinschaft under Germany's Excellence Strategy (EXC 2126/1-390838866); and the Washington Center for Equitable Growth. Code replicating the tables and figures and information about the data used in this article can be found in the Harvard Dataverse: https://doi.org/10.7910/DVN/KOFDTJ. This paper was edited by Chad Syverson.

I. Introduction

The common ownership hypothesis suggests that when large investors own shares in more than one firm within the same industry, those firms may have reduced incentives to compete. Firms can soften competition by producing fewer units, raising prices, reducing investment, innovating less, or limiting entry into new markets. Empirical contributions document the growing importance of common ownership and provide evidence to support the theory.[1] Prominent antitrust law scholars (Elhauge 2016; Scott Morton and Hovenkamp 2017; Hemphill and Kahan 2020) claim that common ownership "has stimulated a major rethinking of antitrust enforcement." The Department of Justice, the FTC, the European Commission, and the Organization for Economic Cooperation and Development (OECD) have all acknowledged concerns about the anticompetitive effects of common ownership and have even relied on the theory and evidence of common ownership in major merger cases.[2]

However, top managers (rather than investors) control firms, firms have hierarchical structures in which operational decisions are delegated to middle managers, and managers may not know the extent of their main investors' shareholdings in other firms. Therefore, skepticism that common ownership affects product market outcomes may be warranted given the lack of a clear mechanism that recognizes these agency problems and informational constraints. This has fueled a vigorous debate about whether existing evidence on common ownership has a plausible causal interpretation and, if it does, how to effectively address the resulting regulatory, legal, antitrust, and corporate governance challenges.

In this paper, we show that managerial incentives can serve as a mechanism that connects common ownership to softer competition. Our mechanism requires neither communication/coordination between shareholders, managers, or firms nor market-level interventions by shareholders or even top managers. The predictions help organize a large set of existing empirical evidence of how prices, quantities, costs, markups, concentration, and governance choices depend on common ownership that thus far lacks a theoretical explanation. In contrast, common ownership mechanisms that require active common owner interventions and assume away agency problems and delegation within organizations generate

[1] Comprehensive surveys by Schmalz (2018, 2021) and Backus, Conlon, and Sinkinson (2019) summarize theoretical contributions and empirical studies providing market-level, industry-level, and economy-wide evidence of the rise of common ownership and its economic effects.

[2] Solomon (2016) reported on an investigation based on Senate testimony by the head of the Antitrust Division, the FTC (2018) featured a hearing on common ownership, and Vestager (2018) disclosed that the commission is "looking carefully" at common ownership given indications of its increase and potential for anticompetitive effects. For other recent activity, see OECD (2017) and European Competition Commission (2017).

predictions that are at odds with the empirical evidence. We document robust empirical support for the central (and previously untested) prediction that higher firm-level common ownership leads to less performance-sensitive incentives for CEOs. We show that common ownership is a first-order determinant of managerial incentives using panel regressions. We address identification challenges related to the endogeneity of ownership with a difference-in-differences design based on competitor index inclusions.

We begin our analysis by embedding a canonical managerial incentive design problem with moral hazard (Holmstrom and Milgrom 1987) in a conventional model of strategic product market competition (D'Aspremont and Jacquemin 1988; Kamien, Muller, and Zang 1992; Raith 2003) with potentially diversified owners (Rotemberg 1984). Our unified model captures the agency conflicts that exist between those who manage firms (top managers) and those who own them (investors), features organizational hierarchies (top and middle managers) with delegated decision-making, and reflects the common setting where large investors hold ownership stakes in several firms in the same industry. The central driving force is that performance-sensitive managerial compensation encourages productivity-improving managerial effort, which in turn has two effects. First, in a setting where product prices are fixed, productivity-improving managerial effort increases firm profitability and is desirable for all types of owners. Second, with endogenous product prices, productivity enhancements also cause firms to set lower prices, which reduces the profitability of competing firms and goes against the interests of common owners. Common owners are therefore more willing to tolerate managerial slack and productive inefficiency at their portfolio firms. The model thus predicts a negative relationship between common ownership and the sensitivity of top management incentives to firm performance. It also provides an explanation for the passivity of common owners who allow top managers to "enjoy the quiet life."

The model also generates additional predictions on how firms set product prices across different markets. First, within the same industry, more commonly owned firms place greater weight on competitors' profits. Therefore, they have optimally weaker managerial incentives that lead to higher costs and thus higher prices than less commonly owned "maverick" firms. Maverick firms place less weight on competitors' profits and therefore endogenously provide stronger incentives to their top managers, are more productive, set lower prices, and obtain greater market shares. Second, even though top managers can exert only a single firm-wide productivity-improving effort (rather than several market-specific ones), commonly owned firms compete less aggressively in markets in which they face other commonly owned firms than in markets in which they face maverick firms. The model proves that a standard firm-level corporate governance mechanism is sufficient for common ownership to affect firm behavior and product market outcomes (differentially across markets within the same industry). Specifically, it can cause the previously documented (but hitherto theoretically unexplained) intraindustry market-level correlations between common ownership and product prices (positive), output (negative), and product market concentration (negative).

Understanding this new mechanism is important for industrial organization and competition policy. Common ownership leads to higher consumer prices, but the source of this anticompetitive effect depends on the organizational structure of firms and whether common owners actively or passively intervene with corporate strategy. For example, we show that when pricing decisions are delegated to product category managers, common ownership leads to lower productivity and higher costs. Only if pricing decisions were centralized with the top manager or if investors directly chose prices themselves would common ownership cause higher markups. Therefore, tests of common ownership that focus exclusively on markups may not detect the anticompetitive impact of common ownership and may underestimate the extent of associated welfare losses. The welfare losses caused by productive inefficiency can be even larger than those caused by increased markups.

Crucially, the mechanism we propose does *not* rely on (i) owners having access to sophisticated market-level incentives or communications to steer product market behavior in different markets, (ii) top managers knowing the ownership structure of either their own firms or their competitors, (iii) top managers making detailed market-specific strategic choices (e.g., setting prices), or (iv) explicit or tacit collusion among managers, firms, or shareholders. Instead, our mechanism relies only on unilateral changes in the firm's objective, on top managers who exert firm-wide productivity-improving effort based solely on their own explicit incentives, and on the delegation of product market choices to middle managers who maximize profits based on market demand and firms' cost structures alone. Combining standard assumptions in corporate finance, organizational economics, and industrial organization is all that is necessary to generate the abovementioned predictions about firm governance, managerial incentives, and product market behavior. Moreover, less realistic mechanisms of common ownership that assume away managerial agency problems and organizational delegation and instead assume active interventions by common owners are at odds with our empirical evidence on managerial incentives.

We empirically confirm the central prediction of a negative relation between common ownership and the performance sensitivity of top management compensation, through which the causal link between common ownership and product market outcomes is established in our model. Using theoretically informed measures of common ownership from the industrial organization literature (Boller and Scott Morton 2020; Backus et al. 2021b) that are also closely linked to our theoretical framework, we document a strong and robust negative relationship between a firm's common ownership and the wealth-performance sensitivity (WPS; the most comprehensive measure of explicit incentives) of its top manager.

In panel regressions, we estimate that an interquartile range shift (25th to 75th percentile) of the firm-level degree of common ownership is associated with a 10.5% reduction in CEO WPS. This result remains robust to using various alternative measures of managerial incentives, common ownership, and industry definitions. Across all dimensions (i.e., managerial WPS, common ownership measures, and industry definitions) of the full matrix of robustness checks, our coefficient estimates are consistently negative, with similar economic magnitudes and statistical significance levels.

Whereas managerial incentives, productivity improvements, competitive actions, market shares, and profits are endogenously determined in our model, firm ownership is assumed to be exogenous. We therefore need to address the empirical concern that endogenous ownership confounds the interpretation of the negative correlation between common ownership and managerial incentives reported in our panel regressions. Specifically, we employ a difference-in-differences design to investigate whether the negative relationship between the strength of managerial incentives and common ownership is also present when we use only the increase in common ownership from additions of industry competitors to the S&P 500 index. In this design, treated companies are index incumbents (i.e., firms that are already in the S&P 500 index) that experience the addition of an industry competitor to the index. The ownership of these treated companies is unaffected. What does systematically change is that the treated firms' (preexisting) shareholders who track the S&P 500 index increase their stakes in the treated firms' *industry competitors* following the index addition of these competitors. In other words, index additions of competitors increase the shareholder profit weights of treated index incumbents but do not change their ownership structure. Following the inclusion of industry competitors in the S&P 500, the treated index incumbents experience a significant increase in the portfolio weights their owners attach to rival profits and the compensation of their top managers becomes significantly less sensitive to their firms' performance. This negative effect on CEO WPS is gradual; it is not present before the inclusion of the competitor into the index and increases in magnitude over time following the index inclusion event.

Our paper contributes to the vast literature on managerial incentives reviewed by Murphy (1999) and Edmans and Gabaix (2016). More specifically, we add to the ample body of theoretical research (beginning with

Hart 1983; Vickers 1985; Fershtman and Judd 1987; Sklivas 1987) and empirical work (including Kedia 1998; Aggarwal and Samwick 1999; Joh 1999; Cuñat and Guadalupe 2005, 2009) that examines the relationship between product market competition and managerial incentives. Our analysis shows that managerial incentives provide a mechanism linking common ownership to product market outcomes and that common ownership is an important factor affecting the aggregate incentive slope. However, we focus exclusively on explicit financial incentives and do not consider the role of implicit incentives resulting from the managerial labor market (Gibbons and Murphy 1992; Fee and Hadlock 2003; Coles, Li, and Wang 2018; Cziraki and Jenter 2021).

II. Theoretical Framework

We analyze the design of optimal managerial incentive contracts in hierarchical multiproduct firms that strategically compete against each other but may share common owners. Our theoretical framework combines specific but standard assumptions from organizational economics, industrial organization, and corporate governance. We establish that managerial incentives can be a mechanism that links common ownership to product market outcomes under these assumptions.

Some of our assumptions capture realistic features of firm organization and strategic competition. Each firm has an organizational hierarchy (Tirole 1986) in which a single top manager makes high-level decisions that affect productivity across the entire firm (Bandiera et al. 2020), but product-specific pricing decisions are delegated to several middle managers (Alonso, Dessein, and Matouschek 2008, 2015; Rantakari 2008; Bloom, Sadun, and Van Reenen 2012b). Owners do not use product-level incentives for middle managers to steer competitive behavior differentially in different product categories, and middle managers are not aware of owners' portfolio holdings. Top managers also do not know the extent of their main investors' shareholdings in other firms. The only parameter that governs their behavior is their compensation contract.

Some of our other assumptions are purposefully restrictive. They are intended to rule out channels that may in practice affect competition between commonly owned firms. For example, we do not allow for explicit or tacit collusion between firms or owners. In line with standard principal-agent models, we also do not allow for communication between owners and managers to directly soften product market competition. Neither investors nor top management communicate their preferences regarding product market competition to middle managers. Top managers do not know (or even need to know) who owns their firm. We examine the effects of relaxing some of these restrictions in extensions of the model.

A. Product Market Competition

Consider a single industry with n multiproduct firms.[3] There are m separate product categories (or geographically separate markets), and within each product category there are n differentiated products, one for each of the n firms. Thus, there are $n \times m$ products in the industry in total.

The model has two stages. Stage 1 is a standard principal-agent setup in which each firm's majority owner (she) proposes a public incentive contract to the firm's top manager (he). In stage 2, each firm's top manager can improve firm productivity (i.e., marginal cost) through costly private effort in response to the managerial incentives designed in stage 1. An empirical justification for this assumption is the presence of large and persistent differences in productivity levels across businesses (Syverson 2011; Backus 2020) that are strongly influenced by management practices (Bloom and Van Reenen 2007; Bloom, Sadun, and Van Reenen 2012a; Bloom et al. 2019, 2021). This productivity improvement is not market specific; it applies to the production costs of all the products the firm produces. In stage 2, the firms also engage in differentiated Bertrand competition in which all of the firms' pricing specialists set product market prices to maximize firm profits, taking firm productivity determined by the top manager's effort choice as given.[4] As is customary, we assume that a manager's privately costly actions in stage 2 are noncontractible but that firm profits are contractible. This allows managerial incentives to be contingent on firm performance. The model's timeline is summarized in figure 1.[5]

Following Singh and Vives (1984) and Häckner (2000), we derive demand from the behavior of a representative consumer with the following quadratic utility function:

$$U(\mathbf{q}) = \sum_{l=1}^{m}\left[\mu\sum_{i=1}^{n} q_{i,l} - \frac{1}{2}\left(\psi\sum_{i=1}^{n} q_{i,l}^{2} + 2\gamma\sum_{i\neq j} q_{i,l}q_{j,l}\right)\right],$$

where $q_{i,l}$ represents the quantity of product i in the same market (or product category) l, $\mathbf{q}$ is the matrix of all quantities for all $n \times m$ products, $\mu > 0$ represents overall product quality, $\psi > 0$ measures the concavity of the utility function, and γ represents the degree of substitutability between differentiated products i and j in market l; $\psi > \gamma > 0$ ensures that

[3] Our analysis abstracts from interindustry and general equilibrium effects of common ownership, which are the focus of Azar and Vives (2021) and Ederer and Pellegrino (2021). We discuss the impact of common ownership on vertical firm relationships in app. sec. B.5.

[4] Appendix section B.1 shows that our results also hold for differentiated Cournot competition (i.e., strategic substitutes).

[5] In app. sec. B.4, we discuss different assumptions about the timing of actions and the observability of contracts.

Stage 1	**Stage 2**
Managerial Incentive Design	**Product Market Competition**
Majority owners (7) propose incentive contracts (s_i, α_i).	Managers (5) exert productivity-improving effort e_i.
Managers accept (or reject) incentive contracts.	Pricing specialists (6) set product market prices $p_{i,l}$.
	Product market profits π_i are realized.

FIG. 1.—Model timeline.

all products in the same market are (imperfect) substitutes. The higher the value of γ, the more alike the products are. For simplicity, we assume that the demand for any products in different markets is independent (i.e., cross-market substitution is zero). The consumer maximization problem yields linear demand for each product i, such that the firms face symmetric demand functions in market l given by

$$q_{i,l}(\overrightarrow{p_l}) = A - bp_{i,l} + a\sum_{j\neq i} p_{j,l}, \tag{1}$$

where $\vec{p} = (p_{1,l}, \ldots, p_{n,l})$ is the row vector of all prices in market l and

$$A = \frac{\mu}{\psi + (n-1)\gamma}, \quad b = \frac{\psi + (n-2)\gamma}{[\psi + (n-1)\gamma](\psi - \gamma)},$$
$$a = \frac{\gamma}{[\psi + (n-1)\gamma](\psi - \gamma)}.$$

By assuming that $\psi > \gamma > 0$, we have $b > (n-1)a > 0$. Thus, a firm's price choice has a greater impact on the demand for its own product than its competitive rivals' actions in that particular market.

Each firm i has a marginal cost given by

$$c_i = \bar{c} - e_i, \tag{2}$$

where $\bar{c} < \mu$ is a constant and e_i represents the effort exerted by firm i's manager.[6]

The profits of firm i are then given by

$$\pi_i = \sum_{l=1}^{m}\left\{[p_{i,l} - (\bar{c} - e_i)]\left(A - bp_{i,l} + a\sum_{j\neq i} p_{j,l}\right)\right\} + \varepsilon_i. \tag{3}$$

Importantly, an increase in the price $p_{j,l}$ of firm j in market l has a positive effect on the profit of firm i—firms benefit from softer competition by rivals. We assume that each firm i's profit π_i contains a profit shock ε_i that

[6] By allowing managerial effort to improve firm productivity in this way, we follow similar setups used in Raith (2003) and in canonical models of corporate (process) innovation under strategic competition (D'Aspremont and Jacquemin 1988; Kamien, Muller, and Zang 1992). Our specification means that the marginal benefit of managerial effort rises with firm size, as in Baker and Hall (2004), who also verify this assumption empirically.

is normally distributed with zero mean and variance σ^2 and independent of other firms' profit shocks.

B. *Top Managers*

All managers simultaneously choose productivity-improving effort levels in stage 2 in accordance with the incentives given by their contracts. The manager of firm i who has an outside option equal to $\bar{u}$ is offered the following total compensation in the form of a linear contract:

$$w_i = s_i + \alpha_i \pi_i, \tag{4}$$

where s_i represents a fixed salary and α_i represents the incentive slope on firm i's profits π_i. This compensation contract mirrors real-world compensation practices, as top managers' compensation is usually tied to their firm's equity value, which reflects the discounted value of firm profits. Furthermore, this compensation contract, which does not condition on competitor profits π_j, is the optimal linear contract even when owners can contract on π_j.[7] The manager's base salary s_i is used to satisfy the individual rationality constraint, which is pinned down by the manager's outside option $\bar{u}$. Each manager's expected utility $u_i(w_i, e_i)$ is given by $\mathrm{E}(-\exp\{-r[w_i - (\chi/2)e_i^2 q_i]\})$, where r represents the degree of risk aversion, $(\chi/2)e_i^2 q_i$ represents his disutility of exerting effort, and $q_i = \sum_{l=1}^{m} q_{i,l}$ represents the total quantity produced by firm i across all m product categories.

The functional form of our cost-of-effort function implies that lowering marginal cost c_i is relatively harder for the manager when the firm is large.[8] This ensures that for a given incentive slope α_i the manager's incentive to exert effort does not vary with the firm's output because both the manager's marginal impact on the firm's profit (through the marginal cost c_i) and the manager's marginal effort cost grow as the size of the firm grows. In other words, for a given incentive slope α_i, the manager's effort is size invariant.

Given the normal distribution of ε_i, maximizing utility is equivalent to maximizing the certainty equivalent (CE):

$$\max_{e_i} \mathrm{CE}_i = s_i + \alpha_i \mathrm{E}[\pi_i] - \frac{r}{2}\alpha_i^2\sigma^2 - \frac{\chi}{2}e_i^2 q_i. \tag{5}$$

Thus, each manager i chooses effort e_i to maximize his expected compensation, net of risk and effort costs.

[7] Put differently, in our model, common ownership does not affect the use of relative performance evaluation (RPE) and therefore does not provide a rationale for its limited use in practice. In app. sec. B.2.3, we further show that all of our results still hold when profit shocks are correlated and owners use RPE for managerial wage risk reduction reasons. Antón et al. (2016) empirically study RPE under common ownership.

[8] Our results about equilibrium managerial incentives remain unchanged if, instead of lowering cost c_i, the top manager can improve firm-wide product quality μ_i.

Our model assumes that the top manager makes only high-level decisions that influence firm-wide productivity and that he does not control more detailed low-level decisions, such as product market pricing. Product market prices are instead set by product specialists.

C. Pricing Specialists

Each firm i has m middle managers, which we label "pricing specialists" to avoid confusion with top-level managers. These can be thought of as divisional managers for a product category or regional managers for a geographic market. In stage 2, each pricing specialist of firm i in product category l chooses price $p_{i,l}$ to maximize the product market profits $\pi_{i,l}$ of firm i in product category l taking firm productivity (i.e., marginal cost c_i), which is simultaneously determined by the top manager's effort e_i, as given.

This delegation of pricing decisions to middle managers matches realistic features of organizations (Bloom, Sadun, and Van Reenen 2012b; Lo et al. 2016) and occurs for reasons not modeled in our theory, such as superior local or product-specific knowledge, middle manager empowerment, decentralization of business units, or negligible cross elasticity of substitution between divisional units (Alonso, Dessein, and Matouschek 2008, 2015; Rantakari 2008). In section IV.A, we explore how centralization changes the predictions concerning product prices, markups, and top management incentives.

The optimal pricing decision is given by

$$\max_{p_{i,l}} \pi_{i,l} = [p_{i,l} - (\bar{c} - e_i)]\left(A - bp_{i,l} + a\sum_{j\neq i} p_{j,l}\right). \tag{6}$$

The pricing specialists choose prices to maximize the individual firm profit in their product market category without taking common ownership motives into account.

D. Owners

There are n owners. Each owner i owns a (majority) stake in firm i as well as shares in other firms $j \neq i$. Ownership is taken to be exogenous.[9] Owner i's objective function can be restated in the following way:

$$\phi_i = \pi_i - w_i + \sum_{j\neq i} \kappa_{ij}(\pi_j - w_j), \tag{7}$$

where $0 \leq \kappa_{ij} \leq 1$ can be interpreted as the value to owner i of a dollar of net profits $(\pi_j - w_j)$ in firm j compared with a dollar of profits in firm i.

[9] We do not consider how and why the various ownership arrangements of firms arise in the first place. Piccolo and Schneemeier (2020) theoretically analyze endogenous common ownership and its interplay with product market competition.

Its exact value depends on the type of ownership and corresponds to what Edgeworth (1881) termed the "coefficient of effective sympathy among firms."[10]

In stage 1, each majority owner i publicly proposes an incentive contract (s_i, α_i) for her manager i, such that the product market behavior in stage 2, as induced by the incentive contract designed in stage 1, maximizes her profit shares in all the firms. The optimal incentive contract for manager i therefore internalizes the effect on profits of other firms in the industry to the extent that the majority owner of firm i also owns cash flow rights of (but does not have influence or control over) those other firms.

The assumption that the majority owner sets the terms of the incentive contract is made for expositional simplicity.[11] The maximization problem for the majority owner of each firm i in stage 1 is subject to the individually rational (IR) and incentive-compatible (IC) constraints of the manager of firm i and the managerial efforts and prices at all firms constituting a Nash equilibrium given each owner i's choice of s_i and α_i. Her maximization problem is given by

$$\max_{s_i,\alpha_i} \phi_i = (\pi_i - s_i - \alpha_i \pi_i) + \sum_{j \neq i} \kappa_{ij} (\pi_j - s_j - \alpha_j \pi_j)$$

$$\text{s.t.} \quad u_i \geq \overline{u} \text{ and } \quad e_i^* \in \arg\max_{e_i} \mathrm{E}[-\exp(-r(s_i + \alpha_i \pi_i - \chi q_i e_i^2/2))] \tag{8}$$

$$\text{and} \quad p_{i,l}^* \in \arg\max_{p_{i,l}} \pi_i.$$

To ensure that each owner's problem has an interior solution and all firms produce positive quantities, we assume that the cost-scaling parameter χ is sufficiently large relative to $\bar{c}$. Table 1 provides a summary of the model setup.

III. Theoretical Analysis

We begin our analysis of the theoretical framework by investigating the effect of common ownership on managerial incentives in an industry with

[10] There is a long tradition in economics of weighting shareholder interests in the objective function of the firm, including Drèze (1974), Grossman and Hart (1979), and Rotemberg (1984). Recent research further suggests that institutional investors internalize broader goals of social responsibility (Hart and Zingales 2017; Oehmke and Opp 2019; Broccardo, Hart, and Zingales 2020; Coffee 2020), including climate change and race issues (Condon 2020; Krueger, Sautner, and Starks 2020; Shekita 2021). We make the more limited assumption that investors partially internalize the product market externalities that their portfolio firms impose on other firms in their portfolio.

[11] This assumption can be understood as a metaphor for an explicit or implicit coalition of shareholders that jointly holds an effective majority of the stock being voted. Explicit coalitions are discussed by Olson and Cook (2017) and Shekita (2021). Moskalev (2020) shows conditions under which shareholders with similar portfolios optimally vote identically and therefore will be regarded as an implicit coalition or a single block by managers. In settings without a majority owner, the largest investor usually has the greatest chance of being pivotal.

TABLE 1
Summary of the Model Setup

Number	Equation	Description
(1)	$q_{i,l} = A - bp_{i,l} + a\sum_{j\neq i} p_{j,l}$	Product demand for firm i in market l
(2)	$c_i = \bar{c} - e_i$	Productivity improvement
(3)	$\pi_i = \Sigma_{l=1}^{m}\{[p_{i,l} - (\bar{c} - e_i)]q_{i,l}\} + \varepsilon_i$	Total firm profits
(4)	$w_i = s_i + \alpha_i\pi_i$	Top manager compensation
(5)	$\max_{e_i}\mathrm{CE}_i = s_i + \alpha_i\mathrm{E}[\pi_i] - \frac{r}{2}\alpha_i^2\sigma^2 - \frac{\chi}{2}q_i e_i^2$	Top manager utility
(6)	$\max_{p_{i,l}}\pi_{i,l} = [p_{i,l} - (\bar{c} - e_i)]q_{i,l} + \varepsilon_i$	Middle manager objective function
(7)	$\max_{s_i,\alpha_i}\phi_i = \pi_i - w_i + \Sigma_{j\neq i}\kappa_{ij}(\pi_j - w_j)$	Owner objective function

symmetric firms. We then consider an extension with firm-level differences in ownership across multiple markets to illustrate the differential effects of common ownership on managerial incentives, costs, prices, quantities, and product market structure.

A. *Symmetric Owners*

To simplify the exposition, we assume that the owners are symmetric as in López and Vives (2019) such that owner i owns a majority stake in firm i and a residual symmetric share in all other firms. Therefore, we have $\kappa_{ij} = \kappa$.

In stage 2 of the game, the managers simultaneously choose effort and pricing specialists choose prices given the set of incentive contracts. For a given contract (s_i, α_i), manager i's first-order condition with respect to productivity-improving effort e_i, along with all the m pricing specialists' first-order conditions with respect to price $p_{i,l}$, can be rearranged to yield the following best-response functions:

$$e_i = \frac{\alpha_i}{\chi}, \tag{9}$$

$$p_{i,l} = \frac{A + b(\bar{c} - e_i) + a\sum_{j\neq i}p_{j,l}}{2b}. \tag{10}$$

First, the stronger the incentives α_i given to the manager, the larger the efficiency improvements e_i he will undertake, as can be seen by the effect of α_i in equation (9). This is because a larger share of the firm's profits rewards the manager for his costly private effort to improve efficiency and profits. This result illustrates that α, in addition to representing an explicit incentive slope, can also serve as a reduced-form mechanism for any governance intervention that improves firm efficiency. In line with this interpretation and our model assumptions, Giroud and Mueller (2011) document that weak governance firms—particularly those in less competitive industries—have lower labor productivity and higher input costs.

Second, stronger managerial incentives also lead to lower prices because the efficiency improvements induced by stronger incentives increase the firm's per-unit profit margin, thereby encouraging the manager to produce a higher quantity and set a lower price. This is apparent by looking at the effect of e_i in equation (10). Stronger managerial incentives lead to more competitive product market behavior in the form of lower prices (and higher output). This feature also means that in our model managerial productivity has a multiplicative effect on firm profits (as in Gabaix and Landier 2008) because it improves the firm's profit margin and increases the size of the firm.

The first-order conditions (9) and (10) yield a system of $(1 + m) \times n$ linear equations, which we solve for the equilibrium efforts $e_i^*(\vec{\alpha})$, equilibrium prices $p_{i,l}^*(\vec{\alpha})$, and equilibrium profits $\pi_i^*(\vec{\alpha})$ of the n firms as a function of the vector of incentive slopes $\vec{\alpha} = (\alpha_1, \ldots, \alpha_n)$. As we will show, these incentive slopes in turn depend on the level of common ownership κ.

Recall that the objective function of the majority owner of firm i, given in equation (7), captures the profit shares in her primary firm i and all other firms $j \neq i$. In stage 1, each majority owner has two instruments at her disposal. First, she uses the salary s_i to satisfy the manager's individual rationality constraint. Second, taking into account the effects of the incentive slope α_i on the stage 2 equilibrium efforts and prices, she uses the incentive slope α_i to maximize her objective function ϕ_i. The derivative of the owner's objective function with respect to α_i is given by

$$\frac{\partial \phi_i}{\partial \alpha_i} = \frac{\partial \pi_i^*}{\partial \alpha_i} - r\sigma^2\alpha_i^2 - \frac{q_i^*\alpha_i}{\chi} - \frac{\alpha_i^2}{2\chi}\frac{\partial q_i^*}{\partial \alpha_i} + \kappa\sum_{j \neq i}\left(\frac{\partial \pi_j^*}{\partial \alpha_i} - \frac{\alpha_j^2}{2\chi}\frac{\partial q_j^*}{\partial \alpha_i}\right).$$

The last term that includes κ captures the impact of changing α_i on the net profits of all the firms other than the investor's primary firm i. Because stronger incentives for the manager of firm i hurt the profits of all other firms $j \neq i$ and because the majority owner of firm i cares about these profits with intensity κ, this leads to our central theoretical result.

PROPOSITION 1. The symmetric equilibrium incentives $\alpha_i = \alpha^*(\kappa) < 1$ given to managers decrease and the firms' marginal costs c_i increase with common ownership κ.

As common ownership measured by κ increases, the (majority) owner of firm i cares relatively more about the net profits of firm j in the industry (see eq. [7]). Thus, each owner now prefers competition to be softer between the firms that she partially owns. In other words, each owner i would now like to induce higher prices $p_{i,l}$ because that benefits the profits π_j of firm j. While the majority owner of firm i does not directly control the product market price $p_{i,l}$, she can induce less aggressive product market behavior (and thus a higher price $p_{i,l}$) by setting a lower incentive slope

α_i in stage 1. As can be seen from the best-response functions (9) and (10), this leads to less cost-cutting effort e_i by the manager (and hence higher marginal cost c_i) and a higher price $p_{i,l}$ set by the pricing specialist of market l in stage 2. This in turn benefits the net profits of firm j, which become a relatively more important part of owner i's portfolio profits ϕ_i as common ownership κ increases.

By forgoing the provision of high-powered incentive contracts, common owners are "excessively deferential" toward managers (Bebchuk, Cohen, and Hirst 2017; Bebchuk and Hirst 2019), relative to both undiversified owners ($\kappa = 0$) and the level of intervention that would obtain if firms did not interact strategically in the product market ($a = 0$), as in Holmstrom (1982). Because managers of more commonly owned firms have less performance-sensitive incentives, they also exert lower effort, resulting in lower firm productivity. This is in line with the interpretation that managers of these firms with endogenously weak corporate governance are allowed to "enjoy the quiet life" (Hicks 1935; Bertrand and Mullainathan 2003) at the expense of firm productivity.

In our model, common ownership has anticompetitive effects in the sense of higher prices. However, these higher prices are not caused by higher markups. Instead, they are the result of a "productive inefficiency" or "cost inefficiency" (in the sense of higher marginal cost c_i than when there is no common ownership) caused by reduced managerial incentives and the resulting underinvestment in productivity improvements. The principal-agent problem and delegation within the firm are the fundamental sources of this productive inefficiency. As we discuss in section IV.A, if a common owner could directly control pricing, she would instead use higher markups and set managerial incentives that are undistorted by common ownership. But without direct control of prices, a common owner optimally underincentivizes the manager of her firm, which in turn raises costs and increases prices while leaving price-cost markups essentially unchanged (except for cost pass-through reasons).

As predicted by our model, Aslan (2019) finds that in the consumer goods industry, the positive relationship between common ownership and prices is channeled largely through marginal cost variation while markups are unaffected by common ownership. Yet even despite this productive inefficiency, not only are portfolio profits ϕ_i higher in equilibrium but net profits $\pi_i - w_i$ are also higher when common ownership is higher, in line with the findings of Boller and Scott Morton (2020).

COROLLARY 1. Firm net profits $\pi_i - w_i$ increase with common ownership κ.

This net profit increase occurs because increases in κ lead to a greater weight on industry rather than individual profits in the objective function. Industry net profits (and, because of symmetry, individual firm net profits) are larger when all the firms partially internalize their firms' actions on other competitors' profits. The resulting reduction in equilibrium managerial incentives α^* allows firms to economize on productivity investment costs (for which the managers have to be compensated through w_i), and this outweighs the losses from the concurrent increase in the marginal production costs c_i.

B. Asymmetric Owners

We now show how asymmetries in firm-level common ownership can differentially affect firms' product market strategies across multiple markets. Firm-level variation in common ownership leads to firm-level variation in managerial incentives and generates firm- and market-level variation in prices, quantities, and concentration, as well as cross-market variation in competitive behavior, even within the same firm.

Consider an industry with three separate product categories or geographically separate markets (l = I, II, III) and three firms ($i = 1, 2, 3$) owned by three investors. Each firm produces a differentiated product in two of the three markets such that there are two firms' products offered in each market. Specifically, firm 1 produces in markets I and II, firm 2 produces in markets II and III, and firm 3 produces in markets III and I. There are three investors such that each firm is controlled by one majority owner and two minority owners hold the remaining cash flow rights. As a result, owner i's objective function is given by

$$\phi_i = \pi_i - w_i + \kappa_{ij}(\pi_j - w_j) + \kappa_{ik}(\pi_k - w_k).$$

Although our analysis focuses on the case with three firms, three markets, and three investors, the results we present in this section straightforwardly generalize to any number of n firms that are owned by n investors and that each produce $n - 1$ products across n distinct markets.

The combined profits of firm i, which competes in markets l and h with prices $p_{i,l}$ for market l and $p_{i,h}$ for market h set by its respective pricing specialists, are given by

$$\pi_i = (p_{i,l} - c_i)(A - bp_{i,l} + ap_{k,l}) + (p_{i,h} - c_i)(A - bp_{i,h} + ap_{j,h}) + \varepsilon_i.$$

For firm i, this results in the following familiar best-response functions from the top manager's effort decision and the pricing specialists' optimal price choices:

$$e_i = \frac{\alpha_i}{\chi},$$

$$p_{i,l} = \frac{A + b(\bar{c} - e_i) + ap_{k,l}}{2b},$$

$$p_{i,h} = \frac{A + b(\bar{c} - e_i) + ap_{j,h}}{2b}.$$

These feature the same positive and negative relationships, respectively, between managerial incentives for effort and prices as with symmetric owners.

The majority owner of firm i solves

$$\max_{s_i,\alpha_i} \phi_i = \pi_i - s_i - \alpha_i\pi_i + \kappa_{ij}(\pi_j - s_j + \alpha_j\pi_j) + \kappa_{ik}(\pi_k - s_k + \alpha_k\pi_k)$$

$$\text{s.t.} \quad u_i \geq \overline{u} \text{ and } \quad e_i^* \in \arg\max_{e_i} \mathrm{E}[-\exp(-r(s_i + \alpha_i\pi_i - \chi q_i e_i^2/2))]$$

$$\text{and} \quad p_{i,l}^* \in \arg\max_{p_{i,l}} \pi_{i,l},$$

where κ_{ij} and κ_{ik} capture the impact of the minority ownership shares that the majority owner of firm i holds in firms j and k.

We assume that there is one undiversified maverick owner who owns 100% of firm 1 (which we call the maverick firm) while the remaining two owners of firms 2 and 3 each own δ of their majority firm and hold a minority stake of $1 - \delta$ in the other firm, where $1/2 \leq \delta < 1$. This results in the following set of common ownership coefficients: $\kappa_{1,2} = \kappa_{1,3} = \kappa_{2,1} = \kappa_{3,1} = 0$ and $\kappa_{2,3} = \kappa_{3,2} = (1 - \delta)/\delta \equiv \kappa$. In markets I and II, the maverick firm is present. Thus, there is no overlap in ownership between the market competitors. In contrast, in the common ownership market III there is common ownership between the two firms, with its impact increasing in κ, which is monotonically related to δ. Figure 2 summarizes the model setup.

Before we derive the implications of these assumptions, we provide a real-world example that illustrates the importance of recognizing asymmetries in common ownership in multimarket settings. Consider the US airline market, which has different geographic markets and routes and substantial firm-level variation in common ownership. Before its merger with and subsequent integration into Alaska Airlines in 2017, Virgin America had a radically different ownership structure compared with other large, publicly listed US airlines such as Delta, American, United, and JetBlue. Panel A of table 2 shows that Virgin America was owned predominantly by two of its founders: the entrepreneur Richard Branson, who held the largest share ownership of 30.77% (as well as another 15.34% through Virgin Group Holdings), and the activist private equity group Cyrus Capital Partners (headed by Stephen Freidheim), which held 23.52%. Neither of these two owners held large stakes in industry competitors. In contrast, panel B of table 2 shows that almost all other US airlines had the same overlapping owners as their largest shareholders. Given these stark differences in ownership arrangements, it is perhaps not too surprising that Virgin America won an unprecedented nine straight awards for “Top Domestic Airline” from *Travel + Leisure* because

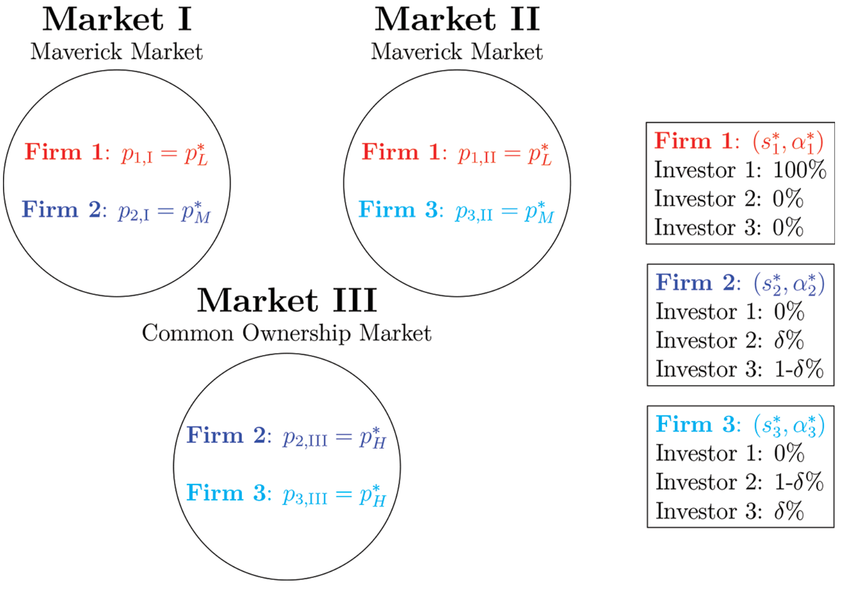

FIG. 2.—Model setup and equilibrium incentives and prices for multimarket firm-level variation in common ownership. Firm 1 is the maverick firm, whereas firms 2 and 3 are the commonly owned firms where $50\% \leq \delta < 100\%$ and $\kappa \equiv (1-\delta)/\delta$. In equilibrium, $\alpha_1^* > \alpha_2^* = \alpha_3^*$ (proposition 2) and $p_H^* > p_M^* > p_L^*$ (corollary 2).

of its high quality and aggressive pricing. Airline industry experts described it as “the epitome of a market disruptor” (Taggart 2016).[12]

1. Managerial Incentives

Under such common ownership with a maverick owner, the objective functions of the owners of firms 2 and 3 are identical, in that they maximize the weighted sum of profits of those two firms, while the maverick owner of firm 1 maximizes solely the profits of firm 1. The resulting equilibrium incentive slopes are α_1^* and $\alpha_2^* = \alpha_3^*$, and the equilibrium prices are $p_L^* \equiv p_{1,\mathrm{I}}^* = p_{1,\mathrm{II}}^*$ for the prices set by the maverick firm 1 in markets I and II, $p_M^* \equiv p_{2,\mathrm{II}}^* = p_{3,\mathrm{I}}^*$ for the prices set by the commonly owned firms 2 and 3 in markets I and II where these firms compete against the maverick firm 1, and finally $p_H^* \equiv p_{2,\mathrm{III}}^* = p_{3,\mathrm{III}}^*$ for the prices set by the commonly owned firms 2 and 3 in market III where these firms compete with each other.

[12] One interesting exception in panel B is the ultra-low-cost airline Allegiant, in which the CEO held the largest ownership stake (20.30%). Tellingly, Allegiant has also been called an “industry disruptor” and a “maverick” by industry experts.

TABLE 2
MAJOR AIRLINES' LARGEST SHAREHOLDERS

Shareholder	%	Shareholder	%	Shareholder	%
A. Virgin America:[a]					
Richard Branson	30.77				
Cyrus Capital Partners	23.52				
Virgin Group Holdings	15.34				
Vanguard	2.89				
BlackRock	2.25				
Alpine Associates Advisors	2.11				
Hutchin Hill Capital	2.09				
Société Générale	1.84				
Apex Capital	1.74				
Morgan Stanley	1.70				
B. Other major US airlines:					
Delta Air Lines		Southwest Airlines		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 Management	3.79	Fidelity	5.53	BlackRock	5.82
Lansdowne Partners	3.60	State Street Global Advisors	3.76	State Street Global Advisors	3.71
PRIMECAP	2.85	J.P. Morgan Asset Management	1.31	Fidelity	3.30
AllianceBernstein	1.67	T. Rowe Price	1.26	Putnam	1.18
Fidelity	1.54	BNY Mellon Asset Management	1.22	Morgan Stanley	1.17
PAR Capital Management	1.52	Egerton Capital (UK)	1.10	Northern Trust Global Investments	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 Management	5.18	PAR Capital Management	3.65	Goldman Sachs Asset Management	2.94
State Street Global Advisors	3.45	State Street Global Advisors	3.52	Dimensional Fund Advisors	2.42
J.P. Morgan Asset Management	3.35	Franklin Resources	2.59	State Street Global Advisors	2.40
Altimeter Capital Management	3.26	BNY Mellon Asset Management	2.34	Wellington	2.07
T. Rowe Price	2.25	Citadel	1.98	Donald Smith	1.80
AQR Capital Management	2.15	Renaissance Technologies	1.93	Barrow Hanley	1.52
Spirit Airlines		Allegiant Air		Hawaiian Airlines	
Fidelity	10.70	Maurice J. Gallagher Jr. (chairman, CEO)	20.30	BlackRock	11.20
Vanguard	7.41	BlackRock	8.61	Vanguard	10.97
Wellington	5.44	Renaissance Technologies	7.28	Aronson, Johnson, Ortiz	5.99
Wasatch Advisors	4.33	Vanguard	6.65	Renaissance Technologies	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 Management	3.33	Wasatch Advisors	4.39	PanAgora Asset Management	2.22
Franklin Resources	2.79	T. Rowe Price	4.23	LSV Asset Management	2.22
Oppenheimer Funds	2.67	TimesSquare Capital Management	3.91	BNY Mellon Asset Management	1.84
Capital Research and Management	2.64	Neuberger Berman	3.07	Numeric Investors	1.79

NOTE.—Data are from S&P Capital IQ (2016:Q4). The table is taken from Azar, Schmalz, and Tecu (2018).
[a] Data for Virgin America are from S&P Capital IQ (2016:Q2) and reflect the shareholder structure before the merger with Alaska Airlines.

Proposition 2. The equilibrium incentives $\alpha_2^* = \alpha_3^*$ given to managers of the commonly owned firms 2 and 3 are strictly lower than those given to the manager of the maverick firm 1, α_1^*. Therefore, $c_2 = c_3 > c_1$. The difference in the managerial incentive slopes and in the costs increases with common ownership κ between the commonly owned firms 2 and 3.

As before, the fact that the stage 2 equilibrium profit $\pi_{j,l}^*(\alpha_i, \alpha_j)$ of firm j in market l is decreasing in α_i immediately establishes the proposition. The intuition is also exactly the same as in the model with symmetric owners. Whereas the undiversified maverick owner cares only about the profits of firm 1, the two common owners of firms 2 and 3 also care about the impact of their respective managers' decisions on the other firm they own and with which they interact in market III. As a result, to induce less aggressive pricing choices (and thus less business stealing), these common owners set lower managerial incentive contracts than the maverick owner does. When common ownership κ increases, the common owners of firms 2 and 3 care more about the impact of their choice of α_2 and α_3 on the profit of the other commonly owned firm and thus reduce these incentive slopes by a greater amount. In our analysis in section VI, we investigate whether the empirical evidence is consistent with this link between managerial incentives and common ownership.

2. Product Market Effects

Beyond establishing a negative relationship between the strength of managerial incentives and common ownership, we can also analyze the impact that our proposed mechanism has on product market outcomes, including prices, quantities, and market structure. We show that even when managers undertake only firm-wide (not market-specific) productivity improvements in response to the managerial incentive contracts given to them and have no knowledge of the underlying ownership structures of their firm, firm-level variation in managerial incentives can generate market-level variation in competitive outcomes within the same industry. This is in accordance with previous empirical findings in the common ownership literature. We begin by studying the effect on product market prices.

Corollary 2. The equilibrium price $p_{2,\mathrm{III}}^* = p_{3,\mathrm{III}}^* = p_H^*$ set by the two commonly owned firms 2 and 3 in market III is higher than the price $p_{2,\mathrm{I}}^* = p_{3,\mathrm{II}}^* = p_M^*$ set by the commonly owned firms 2 and 3 in the maverick markets I and II, which in turn is higher than the price $p_{1,\mathrm{I}}^* = p_{1,\mathrm{II}}^* = p_L^*$ set by the maverick firm in the maverick markets I and II. The difference in prices between the common ownership market III and the maverick markets I and II is increasing in common ownership κ.

This corollary is a direct result of the differential effort choices induced by the difference in incentive contracts. Because the manager of the maverick firm 1 faces more high-powered incentives, he exerts greater effort, which leads to lower marginal costs c_1 than those of the commonly owned firms 2 and 3, $c_2 = c_3$. As a result, the maverick firm is endogenously a low-cost firm, and the price p_L^* set by the maverick firm in markets I and II is always lower than those of the commonly owned firms. This is true both in markets I and II, where they face the low-cost maverick firm and therefore set p_M^*, and in market III, where these high-cost firms face each other and therefore set p_H^*. Hence, $p_H^* > p_M^* > p_L^*$. Finally, because the difference in effort incentives increases with common ownership κ, so does the difference in prices between the common ownership market III and the maverick markets I and II.

Because in our model common owners cannot directly set higher prices but can only indirectly raise prices by lowering managerial incentives and increasing costs, common ownership does not have a direct impact on price-cost markups $p_{i,l}/c_i$. As a result, the effect of common ownership on markups is very small, ambiguous in sign, and driven entirely by cost pass-through. For example, with our linear demand specification the commonly owned firms have a lower average markup across firms than the maverick firm but they charge higher markups in the common ownership market than in the maverick market. In line with our prediction, in the reduced-form empirical studies of Aslan (2019) and Koch, Panayides, and Thomas (2020), price-cost markups are not consistently positively correlated with measures of common ownership. Similarly, the structural analysis of Backus et al. (2021a), in which the profit weights κ_{ij} are not included in the marginal cost specification but directly influence price setting, also rejects that common ownership has large or even modest effects on markups. However, an important takeaway of our analysis is that even when common ownership has no impact on markups, it can still have an anticompetitive effect on prices simply through higher marginal costs resulting from common ownership–induced productive inefficiency.

Corollary 2 provides an explanation for the positive empirical relationship between market-level common ownership and prices, which has been documented for airlines using reduced-form (Azar, Schmalz, and Tecu 2018) and structural (Park and Seo 2019) methods, banking (Azar, Raina, and Schmalz 2021), agricultural seeds (Torshizi and Clapp 2019), and consumer goods (Aslan 2019). Ruiz-Pérez (2019) also provides evidence consistent with a positive relationship between common ownership and prices in airlines but shows that it comes mostly from the effect of common ownership on entry decisions and their effect on the ensuing market structure. Our theoretical framework assumes that owners (who care about their profit shares in other firms, as in eq. [7]) can influence only the managers' productivity improvements but that market specialists set prices solely to maximize their own firms' profits (see eq. [6]). Indeed, Ruiz-Pérez (2019) finds that a hybrid model, in which airlines act exactly according to the common owner profit shares for entry decisions but choose prices to maximize only their own firms' profits, fits the data the best.

The high prices charged in market III are not the result of directly anticompetitive or even explicitly collusive behavior by the two commonly owned firms operating in this market. Rather, they are merely the result of less productive firms (due to weakly incentivized top managers) competing against each other in the same market. This indirect channel is entirely distinct from theories in which common owners directly intervene in firm strategy and pricing. Although effects of common ownership may also operate through more direct channels, our theoretical model illustrates that anticompetitive product market effects can exist without the use of such direct channels.

Another straightforward corollary of proposition 2 is that the quantities produced by the firms, product market concentration, and common ownership are endogenously related. Whereas in the common ownership market the firms charge equal prices (p_H^*) and have equal market shares, the maverick firm charges lower prices (p_L^*) than the commonly owned firms in the maverick markets (p_M^*). As a result, the produced quantities negatively correlate with common ownership, as documented by Azar, Schmalz, and Tecu (2018) for the US airline industry. Moreover, in the maverick markets, the maverick has a larger market share than the commonly owned firm, whereas in the common ownership market, the market shares are symmetric. This leads to greater market concentration than in the common ownership market. As a result, market concentration is negatively correlated with common ownership at the market level. This prediction corresponds to an empirical fact documented in the airline (Azar, Schmalz, and Tecu 2018) and the banking industry (Azar, Raina, and Schmalz 2021) but that until now does not have a theoretical explanation.

Corollary 3. The total equilibrium output Q_ι and product market concentration HHI_ι are lower in the common ownership market than in the maverick markets, $Q_{\mathrm{III}} < Q_{\mathrm{I}} = Q_{\mathrm{II}}$ and $HHI_{\mathrm{III}} < HHI_{\mathrm{I}} = HHI_{\mathrm{II}}$. The output and product market concentration difference between the common ownership and maverick markets increases with common ownership κ.

These results constitute a unified theoretical framework that can rationalize relationships between common ownership and a host of firm-, market-, and industry-level outcomes including prices, quantities, product market concentration, costs, markups, and profits while also explicitly recognizing agency conflicts between shareholders and managers. As such, it provides the first formal mechanism (or "theory of harm") that applies to the common ownership debate as it currently stands. Table 3 summarizes our theoretical results and their relation to the empirical evidence.

TABLE 3
Theoretical Predictions and Empirical Evidence

Theory	Prediction	Level	Empirical Evidence
Propositions 1 and 2	Incentives (−)	Firm	Section VI
	Costs (+)	Firm	Aslan 2019
	Markups (±)	Firm and market	Aslan 2019; Koch, Panayides, and Thomas 2020; Backus et al. 2021a
Corollary 1	Profits (+)	Firm	Boller and Scott Morton 2020
Corollary 2	Prices (+)	Firm and market	Azar, Schmalz, and Tecu 2018; Aslan 2019; Park and Seo 2019; Torshizi and Clapp 2019; Azar, Raina, and Schmalz 2021
Corollary 3	Output (−)	Market	Azar, Schmalz, and Tecu 2018
	Concentration (−)	Market	Azar, Schmalz, and Tecu 2018; Azar, Raina, and Schmalz 2021
Proposition 5	Governance (−)	Firm	Bubb and Catan 2018; Heath et al. 2020
	Entry (−)	Firm and market	Newham, Seldeslachts, and Banal-Estanol 2019; Ruiz-Pérez 2019; Xie and Gerakos 2020
	Investment (−)	Industry	Gutiérrez and Philippon 2018

Note.—Negative, positive, and ambiguous relationships between common ownership and the relevant variable are denoted by the minus sign, plus sign, and plus-minus sign, respectively.

In our model, managerial effort causes cost reductions and lower prices, which affect the profitability of competitors. Other managerial decisions, such as entry or investment choices, influence the profits of competitors in similar ways. Therefore, our theoretical framework also relates (albeit more loosely) to another set of empirical results. Newham, Seldeslachts, and Banal-Estanol (2019), Ruiz-Pérez (2019), and Xie and Gerakos (2020) find evidence that common ownership leads to less aggressive entry decisions in pharmaceuticals and airlines. Gutiérrez and Philippon (2018) document that quasi-indexer ownership reduces investment.[13] Finally, a variation of our model in which managerial effort leads to firm-specific product quality improvements rather than marginal cost reductions similarly predicts a negative relationship between common ownership and

[13] This latter prediction can be reversed in a model of investment in innovation because the impact on other firms' profits can be positive due to technological spillovers (Antón et al. 2018; López and Vives 2019).

managerial incentives but does not necessarily predict a positive relationship between common ownership and prices.

In summary, our theoretical analysis offers a plausible channel—namely, simple and commonly used profit-based managerial incentive contracts—through which increases in common ownership can lead to less competitive product market behavior. Importantly, our model does not require any communication or even cooperation between the different owners themselves or their managers or between product market competitors, nor does it require that top managers or pricing specialists know anything about the identities or motives of their owners. They merely need to know and respond to their own incentives.

IV. Model Variations and Extensions

We discuss a number of model extensions and variations and their implications for interpreting existing evidence on common ownership from the industrial organization, finance, and governance literatures. Appendix B provides additional discussion of the form of strategic competition, RPE, welfare implications, timing and observability assumptions, vertical relationships, endogenous market shares, product market differentiation, and concentration.

A. *Agency Problems and Delegation in Organizational Hierarchies*

Our theoretical framework highlights the importance of recognizing agency problems and organizational hierarchies in studies of common ownership. The organizational hierarchy that assigns high-level firm-wide decisions to top managers but delegates product-specific pricing to middle managers is the reason why in our model common ownership increases prices but does not affect markups (except for cost pass-through). This theoretical prediction is consistent with the reduced-form empirical evidence in Aslan (2019) and Koch, Panayides, and Thomas (2020) and the structural model estimates in Backus et al. (2021a).

Backus et al. (2021a) study markup effects of common ownership and use detailed store-level scanner pricing data from the ready-to-eat cereal industry. They show that an exact version of the common ownership hypothesis without agency conflicts, in which owners (rather than top managers or pricing specialists) directly choose product prices according to the profit weights κ_{ij}, yields implied marginal costs that would be much too low (or even negative) and markups that would be much too high. However, their empirical evidence is at odds with such a simplified model, and they find little empirical support for markup effects of common ownership. Large, positive markup effects of common ownership would also obtain in our model if investors could either (i) directly choose prices themselves, (ii) optimally design the incentives of pricing specialists (i.e., $w_{i,l} = s_{i,l} + \alpha_{i,l}\pi_{i,l} + \Sigma_{j\neq i}\omega_{ij,l}\pi_{j,l}$) and thereby align them with their own, or (iii) centralize all multiproduct pricing decisions in the hands of the top manager and reward him based on competitors' profits (i.e., $w_i = s_i + \alpha_i\pi_i + \Sigma_{j\neq i}\omega_{ij}\pi_j$). All of these assumptions would require mechanisms in which common owners play a much more active role in shaping firm strategies and designing incentives within the organization than in our baseline model.

In appendix section B.2.1, we formally show that either assumption i or assumption ii allows owners to set the managerial incentives α_i^* equal to direct-control incentives α_i^{DC} given by

$$\alpha_i^{\mathrm{DC}} = \frac{1}{1 + (\chi r\sigma^2/q_i)}.$$

Owners can avoid distorting managerial incentives (and thereby avoid incurring productive inefficiency) due to common ownership, which would otherwise be required to indirectly soften competition. Under both of these two assumptions, the incentives of top managers decrease due to common ownership (because common ownership raises prices $p_{i,l}$ and therefore lowers total firm quantity q_i) but only due to its indirect effect through agency problems (i.e., $r\sigma^2 > 0$).[14]

PROPOSITION 3. If owners directly control prices $p_{i,l}$ or can optimally design incentives for pricing specialists, the equilibrium managerial incentives are equal to the direct-control incentives $\alpha_i^* = \alpha_i^{\mathrm{DC}}$ and decrease with common ownership as defined in propositions 1 and 2. Prices $p_{i,l}^*$ and price-cost markups $p_{i,l}/c_i$ increase with common ownership.

In appendix section B.2.2, we present a model variation with assumption iii. In this model variation, there is no delegation of pricing decisions to middle managers; all pricing decisions are instead centralized in the hands of the top manager. Each top manager chooses effort e_i and also all of the firm's m product prices $p_{i,l}$. If managerial incentive contracts are not allowed to condition on rival profits π_j, our previous results in section III are entirely unchanged. Under more general contracting assumptions, we show that common ownership leads to optimal managerial incentives that include positive weights ω_{ij} on rival profits π_j. These ω_{ij} weights increase with κ_{ij} to align managerial pricing decisions with owners'

[14] Appendix section B.3 illustrates that the total surplus loss due to common ownership can be larger or smaller under direct or indirect control of prices by investors. Instead of welfare being lost because of higher markups as under direct control, under indirect control surplus is lost because of higher prices due to lower firm productivity. When managerial effort is relatively inexpensive (i.e., the cost scaling parameter χ is small) and therefore plays an important role in determining productivity and prices, the (indirect) investment distortion can dominate the (direct) price distortion and total welfare can be lower under indirect control than under direct control.

portfolio interests. Holding managerial effort e_i fixed, common ownership leads to higher price-cost markups because managers internalize the effect of their pricing decisions on other firms' profits in accordance with the κ_{ij} portfolio interests of their owners. However, these positive ω_{ij} weights impose additional wage risk on the top manager equal to $(r/2)\omega_{ij}^2\sigma^2$ for which the top manager has be compensated. Therefore, the owner will distort the top manager's incentive slope α_i downward, which leads to lower firm productivity and higher marginal costs c_i.

Proposition 4. If all pricing decisions are centralized with the top manager, the equilibrium managerial incentives α_i^* decrease while prices $p_{i,l}^*$ increase with common ownership as defined in propositions 1 and 2. Price-cost markups $p_{i,l}/c_i$ increase with common ownership if $r\sigma^2$ is sufficiently small.

Thus, even in such a less realistic full centralization model in which top managers set multiproduct prices that are more directly aligned with common owners' interests, the central prediction of our model that greater common ownership leads to less performance-sensitive managerial incentives still holds. However, in addition to ignoring key findings of the organizational delegation and decentralization literature, these model variations based on either i, ii, or iii above generate large markup effects of common ownership that are inconsistent with the existing empirical evidence. Thus, they provide an explanation for why existing empirical estimates deviate from industrial organization models that incorporate common ownership but assume away agency problems and organizational hierarchies.

The more realistic version of our model in which pricing decisions are delegated to middle managers who maximize only their own firm profit π_i rather than investor portfolio profits ϕ_i is consistent with structural estimates of the US airline industry. Ruiz-Pérez (2019) finds that a model of common ownership, in which airlines make both entry and pricing decisions exactly according to the profit weights of their (horizontally diversified) shareholders, matches the data as poorly as a model of completely separate ownership. However, a hybrid model in which airlines act according to shareholder portfolio profit weights (i.e., max ϕ_i as in eq. [7]) for entry decisions and then choose prices to maximize only their own firm profits (i.e., $\max_{p_{i,l}} \pi_{i,l}$ as in eq. [6]) fits the observed data patterns much better. In other words, common ownership leads to less entry, but conditional on entry decisions, common ownership does not affect prices. This is akin to our model in which common ownership does not affect prices conditional on its effect on costs.

B. *Shareholder Passivity*

Our theoretical model employs a canonical principal-agent setup in which the principal (the majority shareholder) sets incentives for the agent (the manager). This same setup has been used as the workhorse model for much of the executive compensation literature and is often referred to as the *contracting view*.

However, such a managerial incentive design problem may convey the idea that lower managerial incentives (and hence anticompetitive product market outcomes) are deliberately and purposefully chosen by common owners. One of the strengths of our model is that it does not require common owners to take the initiative when designing incentives. It is sufficient for common owners to remain passive and thus not push for performance-sensitive compensation to the extent that an undiversified owner (or a diversified owner with holdings in other industries) would. In other words, our model does not distinguish between the absence of an undiversified shareholder pushing for performance-sensitive compensation (e.g., Richard Branson and Stephen Freidheim at Virgin America) and the presence of a large common owner who does not actively push for any particular compensation plan at all. Common owners merely let executives get away with high and performance-insensitive pay by not voting against the compensation plan proposed by management. This is consistent with the *skimming view* of executive compensation (Bertrand and Mullainathan 2000, 2001).[15]

To formalize the idea that common owners have weak incentives to undertake active governance decisions because being passive is sufficient, consider the following variant of our model. To design a managerial incentive contract, a firm's (majority) owner must pay a corporate governance cost $g > 0$. If the owner does not pay g, the manager is given a "default" incentive contract $\underline{w}_i = \underline{s}_i + \underline{\alpha}\pi_i$, where $\underline{\alpha} \in [0, \alpha^{SB})$ and $\underline{s}_i$ is set to satisfy the top manager's IR constraint; α^{SB} is defined as the equilibrium level of incentives that obtains when there is no common ownership (i.e., $\kappa_{ij} = 0$ for all ij). From propositions 1 and 2 we know that this "second-best" incentive slope α^{SB} is higher than any with common ownership ($\kappa_{ij} > 0$). It is the second-best solution from the owners' perspective in the sense that managerial incentives are distorted downward only because of risk aversion and noisy profits (i.e., $r\sigma^2 \geq 0$) but not because of common ownership.

The default incentive contract $\underline{w}_i$ results in managerial effort $\underline{e}_i < e^{SB}$ that is strictly lower than the second-best effort. This assumption is consistent with the evidence that in firms with weak corporate governance, managers have lower incentives, exert lower effort, and are allowed to "enjoy the quiet life" (Hicks 1935; Bertrand and Mullainathan 2003).

[15] As we show in app. sec. B.2.4, using a shareholder "outrage constraint" (Bebchuk and Fried 2006), the contracting and the skimming view differ with respect to whether managers capture economic rents, but they both lead to high, performance-insensitive pay and greater managerial slack under weak governance.

Proposition 5. For any default incentive contract $\underline{\alpha} < \alpha^{SB}$ there exists a threshold $\underline{\kappa}$ such that if $\kappa < \underline{\kappa}$, the majority owner pays the governance cost g to design executive compensation, resulting in the equilibrium incentives given in propositions 1 and 2. If $\kappa \geq \underline{\kappa}$, she does not pay the governance cost g, resulting in lower managerial incentives, lower managerial effort, higher costs, and higher prices.

Common owners (high κ) endogenously choose to be passive and do not engage in the design of managerial incentives, whereas undiversified owners or diversified owners with holdings in other industries (low κ) do engage. This governance passivity of common owners offers an explanation for why the machine-learning analysis of shareholder votes of Bubb and Catan (2018) categorizes the largest five common owners (BlackRock, Vanguard, State Street, Fidelity, and T. Rowe Price) as belonging to the "traditional governance party" of mutual funds. This party is distinctly deferential to management and is generally supportive of management on compensation proposals of all stripes, including say-on-pay proposals specifically. Proposition 5 is also consistent with the empirical results of Schmidt and Fahlenbrach (2017) and Heath et al. (2020). Heath et al. (2020) document that index funds are ineffective monitors who are less likely to vote against firm management on contentious governance issues and do not act to improve corporate governance through their vote or engagement. Schmidt and Fahlenbrach (2017) find a worsening of governance due to increases in passive ownership.[16]

C. *Corporate Governance and Product Market Competition*

Our theoretical results are in contrast to implicit assumptions that the corporate finance, law and economics, and corporate law literatures have made about how common ownership can affect product market competition. For example, a series of papers starting with Bebchuk, Cohen, and Hirst (2017) have argued that because common owners such as index fund managers have "incentives, which would lead them to limit intervention with their portfolio companies . . . it is implausible to expect that index fund managers would seek to facilitate significant anticompetitive behavior" (108–9). Our theoretical framework explains why common owners limit governance interventions with their portfolio companies. However, this passivity does not make the anticompetitive effects of common ownership implausible—quite the opposite. In our model, it is precisely the lack of intervention when setting high-powered incentives for top managers (or "excessively deferential treatment of managers," as

[16] Relatedly, Matvos and Ostrovsky (2008) also document differences in shareholders' voting behavior in mergers and acquisitions as a function of whether shareholders own stakes in both the bidder and the target.

Bebchuk and Hirst [2019] call it) that leads to less competitive product market behavior. In other words, there is no paradox between favoring more effective engagement by institutional investors and being concerned about the anticompetitive effects of common ownership. Weak governance and weak competition are jointly optimal for common owners. This insight is important because it calls into question policy prescriptions that aim to reduce common owners' governance efforts. Such an intervention would weaken both governance and competition at the same time.

Our model also produces new insights for analyzing corporate governance decisions. When firms interact strategically in the product market, from the perspective of portfolio value optimization, it may be optimal for a common owner to act like a "lazy owner," a behavior that is often associated with bad corporate governance. In other words, good governance—in the sense of measures that promote efficiency and shareholder returns from the perspective of an individual firm—imposes a negative (pecuniary) externality on product market rivals. Therefore, common owners of product market rivals may optimally reduce governance interventions, even though this leads to lower productivity, higher costs, and reduced operating performance of any individual firm, as documented by Giroud and Mueller (2010, 2011).

V. Data

Our theoretical framework yields testable implications for the relationship between common ownership and explicit top management incentive slopes. To test the prediction that common ownership is negatively related to the sensitivity of top management economic incentives against the null hypothesis that common ownership does not affect compensation structure, we require data on WPS and ownership, as well as a robust definition of what constitutes product market competitors. In what follows, we first detail the data sources used to construct our variables and then describe how we measure common ownership. Unless otherwise stated, our sample covers the time period between 1992 and 2019 and focuses on the universe of US publicly listed firms.[17]

A. Data Description

1. Executive Compensation

The empirical literature has used three leading measures of WPS. Baker and Hall (2004) and Edmans, Gabaix, and Landier (2009) provide

[17] This restriction is due to a lack of comprehensive data sources for managerial incentives, ownership, and industry classifications for foreign and domestic private firms.

theoretical guidance on when each measure is appropriate. They show that the relevant measure depends on whether CEO productivity is additive, linear, or multiplicative for firm profits.

First, Edmans, Gabaix, and Landier (2009) measure incentives as the dollar change in CEO wealth for a 100 percentage point change in firm value divided by annual pay. We denote this measure as WPS EGL (B^{I} in Edmans, Gabaix, and Landier 2009). This measure is appropriate if CEO productivity has a multiplicative effect on firm profits (and in turn compensation), as it does in our model where managerial productivity improvements lead to both a margin improvement (see eq. [2]) and expansion in firm output due to lower prices (see eqq. [1], [10]). For this reason and because of the empirical validations in Edmans, Gabaix, and Landier (2009) demonstrating its superiority, WPS EGL is our primary measure of managerial incentives. Second, Jensen and Murphy (1990) measure managerial incentives by the change in CEO wealth for a \$1,000 increase in firm value (i.e., a dollar-dollar measure), and we denote this measure as WPS JM (B^{II} in Edmans, Gabaix, and Landier 2009). If managerial productivity were constant in dollar terms regardless of firm size (e.g., if managerial effort were simply an additive term in the firm profits in eq. [3]), WPS JM would be the appropriate measure of managerial incentives. Third, Hall and Liebman (1998) measure incentives as the dollar change in CEO wealth for a percentage change in firm value. This measure is the executives' effective dollar ownership (i.e., their "equity at stake"), and we denote it as WPS HL (B^{III} in Edmans, Gabaix, and Landier 2009). If managerial productivity were linear in firm size (e.g., if managerial effort improved only the profit margin in eq. [3] but had no impact on prices and hence output), WPS HL would be the correct measure. We use these additional two measures as robustness checks of the WPS EGL measure since they have been widely used in the incentives literature.[18] Summary statistics about the mean, standard deviation, and distribution of the three leading WPS measures and CEO tenure are given in table 4.

Our empirical analysis constructs the outcome variable using the ExecuComp database, which contains over 3,462 companies, both active and inactive. The universe of firms covers the S&P 1500, plus companies that were once part of the S&P 1500, plus companies removed from the index that are still trading. Accounting and financial data for our controls, such as volatility, leverage, and market equity, come from Compustat.

[18] One issue with the EGL measure is that because CEO wealth is unobservable, EGL is scaled by annual CEO income. This is consistent with our theoretical model in which CEO income and wealth are proportional. However, in reality this may not be the case because of the volatility of CEO income. The two other WPS measures are not subject to this criticism.

TABLE 4
SUMMARY STATISTICS FOR KEY VARIABLES

Variable	N	Mean	Median	Standard Deviation	10th Percentile	90th Percentile
CEO variables:						
WPS EGL	47,994	20.42	5.77	44.85	1.04	44.27
WPS JM	47,994	16.86	5.62	28.16	.51	47.32
WPS HL	47,994	51.84	18.07	85.31	2.12	142.57
Tenure (in years)	48,651	7.39	6.00	4.73	1.00	15.00
Firm and industry variables:						
ln(market equity)	47,563	7.684	7.572	1.599	5.741	9.840
Volatility	47,514	.102	.089	.052	.049	.172
Leverage	47,373	.242	.219	.213	.000	.497
HHI (at industry SIC-4 level)	10,670	.581	.522	.314	.175	1.000
Common ownership measures (SIC-4 CRSP):						
Kappa	44,239	.337	.263	.689	.041	.637
Cosine similarity (first component of kappa)	44,239	.307	.278	.203	.060	.608
Ratio of IHHIs (second component of kappa)	44,239	1.268	.990	2.742	.549	1.833
Top 5 shareholder overlap	45,996	.092	.079	.066	.015	.189
AP measure	46,761	.0006	.0005	.0005	.0002	.0013
HJL measure	46,761	.0002	.0002	.0002	.0001	.0005
MHHID (at industry SIC-4 level)	10,670	.145	.101	.155	.006	.334

NOTE.—This table reports summary statistics for the variables at the CEO level (WPS and tenure), at the firm level (performance, market equity, volatility, kappa, cosine similarity, IHHI ratio, top 5 shareholder overlap, AP, HJL), and at the industry level (HHI and MHHID). The WPS measures are WPS EGL (Edmans, Gabaix, and Landier 2009), WPS JM (Jensen and Murphy 1990), and WPS HL (Hall and Liebman 1998).

2. Ownership

To construct the ownership variables, we use two sources of data: Thomson Reuters (institutional ownership in 13F) and Schwartz-Ziv and Volkova (2021; blockholdings in 13D and 13G). The Thomson Reuters 13Fs are taken from SEC regulatory filings by institutions with at least $100 million total assets under management. We augment this data by scraping SEC 13F filings following Ben-David et al. (2020), which resolves the issues of stale and omitted institutional reports, excluded securities, and missing holdings from 2000 onward.

We complement these institutional ownership data with blockholdings data from Schwartz-Ziv and Volkova (2021) because there are large, influential blockholders in many publicly listed US firms. The presence of such blockholders might be correlated with ownership by 13F institutional investors in a systematic way and also correlate with our outcome measures. For example, some 13F institutions might have a preference for or against firms with family blockholders, which may systematically differ in their approach to governance. Thus, incorporating both institutional and noninstitutional blockholders is important for the measurement of common ownership. We describe the precise construction of the common ownership variables from these data in the following section.

3. Industry Definitions

Following the existing corporate finance literature, our baseline specifications define industries by four-digit Standard Industrial Classification (SIC) codes from the Center for Research in Security Prices (CRSP). We also investigate whether our results are robust to using Compustat SIC-4 industry definitions and the 10K-text-based industry classifications of Hoberg and Phillips (2010, 2016; henceforth, HP classifications). Finally, for additional robustness checks, we use coarser three-digit SIC codes. The advantage of broader industry definitions is that they may be more appropriate for multisegment firms. Two significant disadvantages are that the market definition necessarily becomes less detailed and thus less accurate for focused firms and that the variation used decreases.

Despite our efforts to use robust industry definitions, we acknowledge that no single one is perfect. In general, the assumption that an industry corresponds to a market in a way that precisely maps to theory will deviate from reality, no matter whether SIC or HP classifications are used. Moreover, using Compustat to extract sales and compute market shares means that we miss private firms in our sample. Studies that focus on one industry alone and benefit from specialized data sets for that purpose can avoid or mitigate these shortcomings. However, for firm-level studies involving multiple industries, the imperfection implied by coarser industry definitions is unavoidable. Our baseline assumption is that this deviation from the model—and from reality—leads to measurement error. We have no good reason to assume that these limitations should lead to false positives (or negatives) rather than attenuation bias. Nonetheless, it is advisable to keep these limitations in mind when deriving a quantitative interpretation of the results.

B. Measuring Common Ownership

To identify how common ownership is related to managerial incentives, we require a measure of common ownership. The existing literature provides several candidate measures of common ownership, the first of which is closely linked to the theoretical literature on common ownership, including our own model.

From equation (7), recall that the objective function of firm i is given by

$$\phi_i = \pi_i - w_i + \sum_{j \neq i} \kappa_{ij}(\pi_j - w_j),$$

where κ_{ij} represents the weight that firm i places on its industry competitors j's net profits, $\pi_j - w_j$. Specifically,

$$\kappa_{ij} = \frac{\sum_o \gamma_{io}\beta_{jo}}{\sum_o \gamma_{io}\beta_{io}},$$

where β_{io} represents the ownership share of firm i accruing to shareholder o and γ_{io} represents the control share of firm i exercised by shareholder o. We calculate the ownership share of investor o in firm i, β_{io}, as the percentage of all shares of firm i held by shareholder o. Following previous literature and specifically Backus et al. (2021b), we assume proportional control—that is, $\gamma_{io} = \beta_{io}$ as a baseline.[19]

The discussion on proportional control is important in the aggregation of shareholder preferences at the firm-pair level. However, we need a measure of kappas at the firm level, $\overline{\kappa}_i$. Thus, the weighted sum of these profit weights κ_{ij} across all the industry competitors of firm i is our main measure of common ownership. We aggregate κ_{ij} by taking an equal- or value-weighted average of the weights on the profits of the $n - 1$ industry competitors of firm i as $\overline{\kappa}_i$ (or simply "kappa") defined as

$$\overline{\kappa}_i = \frac{1}{n-1}\sum_{j\neq i}\kappa_{ij} \quad \text{or} \quad \overline{\kappa}_i = \frac{1}{\sum_{j\neq i} v_j}\sum_{j\neq i}\kappa_{ij}v_j, \tag{11}$$

where the weighting v_j represents the stock market value of firm j that competes in the same industry as firm i.[20]

Although the average profit weight $\overline{\kappa}_i$ is the leading measure for measuring common ownership and directly maps to the profit weights used in our theoretical analysis, it is certainly not a perfect or "correct" measure of common ownership. It is therefore important to verify that our empirical results are robust to using alternative measures of the extent to which a firm's most powerful shareholders care about competitor profits.

Backus et al. (2021b) show that under proportional control ("one share, one vote") each profit weight κ_{ij} can further be decomposed into

$$\kappa_{ij} = \underbrace{\cos(\beta_i, \beta_j)}_{\text{overlapping ownership}} \times \underbrace{\sqrt{\frac{\mathrm{IHHI}_j}{\mathrm{IHHI}_i}}}_{\text{relative IHHI}}. \tag{12}$$

[19] We can relax this assumption to test whether our results are robust to other reasonable specifications. Like Backus et al. (2021b), we use a power function such that $\gamma_{io} = \beta_{io}^{\lambda}$. As we increase the value of λ, we increase the convexity of the control weights and place more weight on the largest investors. Table C2 shows that our results are robust to different values of λ.

[20] Throughout our empirical analysis, we use value-weighted measures of common ownership because these most closely match our theoretical analysis. The results are similar for equal-weighted measures of common ownership.

The first term is the cosine of the angle between the vector β_i of ownership positions β_{io} that owners o hold in firm i and the corresponding vector β_j for firm j. The second term is the ratio of the investor Herfindahl-Hirschman indexes ($\text{IHHI}_i = \Sigma_o \beta_{io}^2$ and $\text{IHHI}_j = \Sigma_o \beta_{jo}^2$) for the owners of firm i and j.

The cosine similarity captures the overlap in ownership and is the origin of the incentive to internalize the profits of another firm. Abstracting from the possibility of large short positions, ownership shares in (i, j) are nonnegative, and therefore this similarity metric $\cos(\beta_i, \beta_j)$ is restricted to the [0, 1] interval. A cosine similarity of zero corresponds to no common ownership, while a cosine similarity of one corresponds to identical shareholding structures. Since this is an L_2 similarity measure, the metric puts more weight on large owners than small owners. The second source of variation in common ownership profit weights comes from the ratio of the IHHI indexes. Firms with relatively more concentrated investors place more weight on their own profits and less weight on competitor profits.

Ownership similarity is the symmetric component of the profit weight; if it increases, it will increase the objective functions of both firms in the industry. Alternatively, the relative shareholder concentration term is inherently asymmetric. To the extent that the asymmetric incentives of the profit-weight model are limited by legal restrictions or managerial behavior, empirically we may see the first-order effects of common ownership propagate through cosine similarity, as suggested by Boller and Scott Morton (2020). We therefore also use the weighted averages of the cosine similarity across all the $n - 1$ competitors (indexed by j) of firm i as a firm-specific measure for common ownership, which are given by

$$\overline{\cos}_i = \frac{1}{n-1}\sum_{j\neq i}\cos(\beta_i, \beta_j) \quad \text{or} \quad \overline{\cos}_i = \frac{1}{\sum_{j\neq i} v_j}\sum_{j\neq i}\cos(\beta_i, \beta_j)v_j. \tag{13}$$

An alternative measure we employ is the average fraction of competitor shares held by the firm's top five shareholders, which we call the Top 5 shareholder measure. This is a model-free measure. In particular, this firm-specific measure for firm i is defined as

$$\overline{\text{Top5}}_i = \frac{1}{n-1}\sum_{o}^{5}\sum_{i\neq j}\beta_{jo} \quad \text{or} \quad \overline{\text{Top5}}_i = \frac{1}{\sum_{j\neq i} v_j}\sum_{o}^{5}\sum_{i\neq j}\beta_{jo}v_j, \tag{14}$$

where β_{jo} again represents the ownership share of firm j accruing to shareholder o, who is one of the five largest owners of firm i, and j indexes all of firm i's competitors (of which there are $n - 1$ for a given industry).

Another established and popular measure of connectivity and ownership overlap between firms comes from Antón and Polk (2014). It constructs a measure of common ownership that is the total value of stock held by all the common shareholders o of two industry competitors i

and j, scaled by the total market capitalization of the two stocks i and j. Specifically, this pair-level measure is

$$\mathrm{AP}_{ij} = \frac{\sum_o (S_i^o P_i + S_j^o P_j)}{S_i P_i + S_j P_j},$$

where S_i^o represents the number of shares held by owner o of firm i trading at price P_i with a total of S_i shares outstanding, and similarly for the stock of firm j. We use the weighted average across all $n-1$ industry competitors of firm i and refer to it as the Anton-Polk (AP) measure of common ownership:

$$\overline{\mathrm{AP}}_i = \frac{1}{n-1}\sum_{j \neq i} \mathrm{AP}_{ij} \quad \text{or} \quad \overline{\mathrm{AP}}_i = \frac{1}{\sum_{j \neq i} v_j}\sum_{j \neq i} \mathrm{AP}_{ij} v_j. \tag{15}$$

We also use the modified cross-holdings measure from Harford, Jenter, and Li (2011; henceforth, the HJL measure), which accounts for the incentives of common investors during the merger of two firms. In their setting, the shareholders of a bidding firm are more likely to internalize the effect of paying a lower takeover premium on the target firm if they also own shares of the target. To capture this externality of common ownership, they estimate each investor's relative ownership stake in the target to that of the acquirer in the following way: $\mathrm{HJL}_{bt} = \beta_{to}/(\beta_{bo} + \beta_{to})$. We build this measure for each investor and aggregate these relative weights across investors for each pair of firms (instead of bidder b and target t, we follow our consistency labeling the firms focal i and competitor j). The weight that each investor has in this measure is her ownership in the focal firm, β_{io}. Specifically, this pair-level measure is given by $\mathrm{HJL}_{ij} = \Sigma_o \beta_{io}[\beta_{jo}/(\beta_{io} + \beta_{jo})]$. We use the weighted averages of this measure across all industry competitors of firm i, given by

$$\overline{\mathrm{HJL}}_i = \frac{1}{n-1}\sum_{j \neq i} \mathrm{HJL}_{ij} \quad \text{or} \quad \overline{\mathrm{HJL}}_i = \frac{1}{\sum_{j \neq i} v_j}\sum_{j \neq i} \mathrm{HJL}_{ij} v_j. \tag{16}$$

Finally, we use the modified Herfindahl-Hirschman index Δ (MHHID) as another measure of common ownership. This measure, originally developed by Bresnahan and Salop (1986) and O'Brien and Salop (2000), is used by regulators worldwide to assess competitive risks from the holdings of a firm's stock by direct competitors and has been used by a number of previous empirical contributions to the literature on common ownership. Specifically, it is derived from the total market concentration (MHHI), which is composed of two parts: product market concentration as measured by HHI ($\Sigma_i s_i^2$) and common ownership concentration as measured by MHHID. HHI captures the number and relative size of competitors, and MHHID captures to what extent these competitors are connected by common ownership. Formally,

$$\underbrace{\sum_i \sum_j s_i s_j \frac{\sum_o \gamma_{io}\beta_{jo}}{\sum_o \gamma_{io}\beta_{io}}}_{\text{MHHI}} = \underbrace{\sum_i s_i^2}_{\text{HHI}} + \underbrace{\sum_i \sum_{j \neq i} s_i s_j \frac{\sum_o \gamma_{io}\beta_{jo}}{\sum_o \gamma_{io}\beta_{io}}}_{\text{MHHID}}. \tag{17}$$

As before, we assume proportional control, $\gamma_{io} = \beta_{io}$. An attractive feature of MHHID is that it can be microfounded with a voting model (Azar 2016; Brito et al. 2018). The disadvantage of this measure relative to firm-level measures of common ownership (e.g., $\overline{\kappa}_i$, $\overline{\cos}_i$, $\overline{\text{Top5}}_i$, $\overline{\text{AP}}_i$, $\overline{\text{HJL}}_i$)[21] is that MHHID may absorb relevant cross-sectional variation (of shareholder overlap between the different companies) across firms within the same industry. By looking at firm-level measures of the "effective sympathy" that one firm's shareholders should have toward connected firms based on their portfolios, we more precisely capture the intensity of the influence of potentially asymmetric common ownership links between firms. For example, one firm in an industry of five competitors may be controlled by a single investor without stakes in competitors, whereas the other four firms are commonly owned.[22] Table 4 reports summary statistics for the different common ownership measures.

VI. Empirical Analysis

A. *Empirical Design*

The main contribution of our theoretical analysis is to provide a mechanism—namely, managerial incentive contracts—through which common ownership can affect product market structure and outcomes. We thereby provide an explanation for various previously documented (but unmodeled) results in the literature. However, the central prediction of our proposed mechanism, which has not been tested thus far, is that the strength of top management incentives varies across firms by the level of common ownership of the firms they manage. We now empirically test this

[21] An omission from this list of firm-level measures of common ownership is the measure proposed by Gilje, Gormley, and Levit (2020). This is because in their model "the measure cannot be interpreted as a profit weight" (Backus, Conlon, and Sinkinson 2020) and, by assumption, it "does not allow for strategic interactions" between either managers or firms (Gilje, Gormley, and Levit 2020). It is therefore unsuitable in our context, which explicitly links managerial incentives to investor profit weights and focuses on strategic interactions between firms.

[22] To address the potential endogeneity of market shares that are an input to MHHID, we also use an equal-weighted (rather than market-share-weighted) measure of MHHID, denoted by MHHID 1/N.

prediction using various measures of WPS and several common ownership measures.[23]

Our baseline panel analysis uses the following specification:

$$\mathrm{WPS}_{ijzt} = \theta \cdot \mathrm{CO}_{it} + \xi \cdot X_{ijz_4t} + \eta_{z_2t} + v_i + \varepsilon_{ijzt}, \tag{18}$$

where i indexes firms; j indexes managers; z_4 denotes industries at the four-digit level and z_2 at the two-digit level; X is a vector of controls; η_{z_2t} and v_i represent industry-year and firm fixed effects, respectively; and CO_{it} is our principal variable of interest, a measure of common ownership. Because our theoretical framework does not yield an explicit solution for the optimal managerial incentive slope, we remain agnostic as to the specific functional form in which common ownership influences managerial WPS. We use rank-transformed measures of common ownership, including equal- or value-weighted averages of profit weights, average cosine similarity, the top 5 shareholder, the AP measure, and the HJL measure, as well as industry-level MHHID, to allow for straightforward comparisons. All these common ownership measures are at the firm level except MHHID, which is measured at the four-digit industry level.

In our panel regressions, we use fixed effects to difference out potentially confounding variation. For example, there could be industry-level trends in common ownership that are correlated for unmeasured reasons with trends in managerial incentive slopes. Including industry-year fixed effects ensures that the common ownership coefficient is not estimated from such correlated trends. The remaining source of identifying variation is mainly differences across firms in changes over time in common ownership and incentive slopes.[24] The firm fixed effects ensure that the results are not driven by unobserved omitted firm characteristics that happen to be correlated with both common ownership and incentive slope levels.

To make sure that our results are not driven by outliers, we winsorize our measures of compensation, sales, book-to-market ratio, and institutional ownership at the 1% level. All standard errors are clustered two ways, at the firm and year level (Petersen 2009).

[23] An empirical analysis of the effect of managerial incentives on productivity and product market outcomes would require measuring or estimating managerial effort and firms' marginal costs, which we do not undertake in this paper.

[24] There is also remaining variation across four-digit industries within two-digit industry-years. In regressions that use MHHID as the measure of common ownership, the only remaining variation is across four-digit industries within two-digit industry-years. All our coefficient estimates for firm-level measures of common ownership persist if we use four-digit industry-year fixed effects instead.

B. Panel Regressions

Table 5 presents results from our baseline panel regressions. Column 1 regresses the natural logarithm of WPS on our principal measure of interest, the year-by-year rank-transformed, equal-weighted average $\overline{\kappa}_{it}$, while controlling for size, book-to-market ratio, volatility, leverage, executive's tenure with the firm, and institutional ownership,[25] as well as using (time-invariant) firm fixed effects and (time-varying) industry-year fixed effects.[26] The coefficient on the equal-weighted $\overline{\kappa}_{it}$ is negative (-0.239) and statistically significant. That is to say, WPS tends to be significantly lower for CEOs of firms that are more commonly owned. Column 2 uses the same specification as column 1 but instead uses the more appropriate value-weighted average $\overline{\kappa}_{it}$ as a measure of common ownership, to account for relative firm size among competitors. This paper's theoretical analysis suggests that relative firm sizes should matter for the preferences of common owners (e.g., eq. [7]). The coefficient estimate for $\overline{\kappa}_{it}$ is very similar in magnitude (-0.222) and also statistically significant at the 1% level. Our coefficient estimates are also almost identical when we use higher-order polynomials or quintile dummies of the firm size measure, thus assuaging concerns that the common ownership variable might be picking up a nonlinear effect of firm size. Our baseline results are based on $\overline{\kappa}_{it}$ computed assuming proportional control. Relaxing this assumption yields similar results, as shown in table C2, where we vary the values of λ in a way similar to that done by Backus et al. (2021b).

All specifications use firm fixed effects to remove firm-invariant characteristics and industry-time fixed effects to account for trends in WPS that are industry specific and may change over time. For example, important events such as the tech bubble in the early 2000s or the 2008 financial crisis may have affected industry compensation practices differently across time. The inclusion of these fixed effects ensures that we avoid spurious inferences from industry-wide trends or time-invariant firm compensation policies, instead basing our inferences only on within-firm and within-year variation.[27]

Importantly, because our regressions include firm (and industry-year) fixed effects, the results should be interpreted as driven by within-firm

[25] In table C1, we explore the relationship between common ownership and institutional ownership in different specifications, as computed in Hartzell and Starks (2003). Our results are robust to the exclusion of institutional ownership as well as the inclusion of different institutional ownership–related variables.

[26] To achieve a close match between the multiplicative structure of managerial effort in our model and the empirical tests, this specification follows the analysis of CEO incentives in table 2 of Edmans, Gabaix, and Landier (2009). The key differences are the additional fixed effects, industry controls, and the common ownership measure.

[27] Table C3 shows that our results are robust to alternative fixed effects specifications (including the absence of fixed effects).

TABLE 5
WPS as a Function of Common Ownership

	ln(WPS EGL)					
	SIC CRSP		SIC Compustat		HP	
Industry Definition	(1)	(2)	(3)	(4)	(5)	(6)
Common ownership (equal-weighted kappa)	−.239***		−.257***		−.220***	
	(.051)		(.045)		(.053)	
Common ownership (value-weighted kappa)		−.222***		−.238***		−.197***
		(.048)		(.047)		(.056)
Volatility	1.133***	1.149***	.822***	.826***	.883***	.898***
	(.274)	(.275)	(.287)	(.287)	(.273)	(.274)
ln(market equity)	.370***	.372***	.370***	.373***	.392***	.394***
	(.020)	(.020)	(.020)	(.020)	(.024)	(.025)
Leverage	.0242	.0257	−.0109	−.00731	.0120	.0147
	(.064)	(.064)	(.061)	(.061)	(.072)	(.073)
HHI	−.120	−.124	−.0350	−.0353	.00747	.0104
	(.073)	(.073)	(.089)	(.089)	(.058)	(.059)
ln(tenure)	.492***	.492***	.487***	.486***	.496***	.496***
	(.029)	(.029)	(.028)	(.028)	(.035)	(.035)
Institutional ownership	−.398***	−.385***	−.430***	−.415***	−.319***	−.305***
	(.075)	(.074)	(.077)	(.075)	(.070)	(.069)
Observations	42,492	42,492	45,369	45,369	33,905	33,905
R^2	.684	.684	.690	.689	.699	.699
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry SIC-3 × year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Note.—This table presents the coefficients from regressions of the EGL measure of WPS (Edmans, Gabaix, and Landier 2009) on common ownership (equal- and value-weighted $\bar{\kappa}$) while controlling for firm fixed effects and industry × year fixed effects. The universe covers all CEOs from 1992 to 2019 present in ExecuComp. We use industry definitions based on four-digit SIC codes from CRSP and Compustat as well as the HP 400 definition. Note that the HP industry definitions are available starting in 1996.

*** $p < .01$.

(and within-industry-year) variation in ownership and compensation structure over time. Firms change the WPS of their CEOs' compensation based on changes in how much shareholders place on the profits of industry competitors.

To conservatively estimate whether there is a significant panel correlation between common ownership and WPS, we present fully saturated regressions with a large number of fixed effects that might absorb more variation than desirable to arrive at the most meaningful quantitative estimates. That said, the estimated coefficient is similar in magnitude to other first-order determinants of WPS in the literature. Shifting a firm's average profit weight from the 25th to the 75th percentile of the distribution of value-weighted average kappa would be associated with a 10.5% decrease ($=e^{-0.222\times(0.75-0.25)}-1$) in CEO WPS.

This reduction in WPS can have a meaningful effect on a CEO's wealth. Recall that WPS is the dollar change in CEO wealth for a 100 percentage point change in firm value divided by annual flow compensation. For the average CEO in our data, WPS is around 20, and average flow compensation for a CEO in the S&P 500 was $14.8 million in 2019. For a CEO at the 75th percentile of common ownership, a 50% increase in firm value would thus increase his wealth by $148 million. This number is almost $17 million (or almost three-quarters of the CEO's annual compensation) smaller if the firm ranks 50 percentiles lower in terms of its common ownership weights (10.5% × $148 million = $15.54 million).

1. Alternative Industry Definitions

Our empirical analysis assumes that firms belonging to the same industry definitions compete in at least some product markets. Four-digit definitions could be either too narrow (if firms compete in multiple product markets labeled by different industry definitions) or too broad (if firms compete in only some product markets but not others, all of which belonging to the same industry designation). Alternative industry definitions of a given granularity could also vary with respect to the extent to which they capture product market interactions. We now investigate to what extent our results are sensitive to alternative industry definitions.

Specifications 3–6 of table 5 present evidence of the robustness of the results shown in columns 1 and 2 to the data source used to compute industries. Columns 1 and 2 use CRSP definitions of SIC-4 codes, whereas columns 3 and 4 use Compustat and columns 5 and 6 use the HP four-digit industry definitions. The coefficient estimates for common ownership remain similar in magnitude and statistically significant in all specifications. We conclude that our baseline results are robust to what is considered a competitor for any given firm and to how industries are defined.

2. Alternative Measures of Common Ownership

Our baseline results may suffer from a concern about the particular measure of common ownership we use—namely, the weighted average of the profit weights that a firm i attaches to the profits of other firms. Although this particular measure has several attractive properties and is closely related to our theoretical analysis, there is no generally accepted theory to inform corporate objectives when firms are not price takers and shareholders have interests outside the firm. Therefore, we examine how the results change as we employ several alternatives that capture to what extent firms should display "effective sympathy" to their industry competitors. First, following Backus et al. (2021b), we decompose the profit weights into their subcomponents and compute a firm's average of the cosine similarity with its industry competitors. Second, we calculate to what extent the top five shareholders in a firm own competitor stocks as well. Third, we use the AP measure of common ownership. Fourth, we use the HJL cross-holdings measure. Fifth, following the extant literature on common ownership, we use the MHHID and MHHID 1/N measures, which vary only at the industry level.

We present the results in table 6. All measures of common ownership are significantly negatively related to CEO WPS with magnitudes comparable with our baseline estimates. An interquartile range move in the various alternative common ownership measures corresponds to a decrease of 6.6% ($=e^{-0.136\times(0.75-0.25)}-1$) to 11.1% ($=e^{-0.237\times(0.75-0.25)}-1$) in CEO WPS.

In table C4, we further show that this pattern also holds when using alternative industry definitions. We obtain very similar coefficient estimates that are statistically significant across almost all measures of common ownership and all industry definitions.

We also investigate which of the two components of the weighted average of the profit weight κ is principally responsible for the negative impact on WPS. In table C6, we show that both the cosine similarity and the IHHI ratio are negatively associated with WPS.

3. Alternative Measures of WPS

Another important question regarding the evidence we have presented so far is to what extent our insights are robust to the way managerial WPS is calculated. To investigate this question, table 7 presents the same specifications as in table 5 but with various alternative outcome variables, providing different measures of the sensitivity of CEO wealth to firm performance.

In table C5, we show that this pattern also holds for alternative industry definitions and alternative measures of common ownership, thus illustrating that across all dimensions (i.e., WPS, common ownership measures, and industry definitions) of the full matrix of robustness checks, our results remain consistently negative, with similar economic magnitudes and statistical significance levels. Columns 1–3 use Jensen and Murphy's (1990) WPS measure, and columns 4–6 use Hall and Liebman's (1998) version of WPS. The results are qualitatively similar in magnitude to those presented in tables 5 and 6 and are statistically significant throughout. An interquartile reduction in value-weighted κ corresponds to a −8.0% reduction in WPS JM and a −5.3% reduction in WPS HL, both of which are comparable with the −10.5% reduction in the benchmark WPS EGL measure.

TABLE 6

WPS as a Function of Common Ownership: Alternative Common Ownership Measures

	ln(WPS EGL)						
Dependent Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Common ownership (kappa)	−.222***						
	(.048)						
Common ownership (cosine similarity)		−.227***					
		(.052)					
Common ownership (top 5 overlap)			−.136***				
			(.037)				
Common ownership (AP)				−.200**			
				(.087)			
Common ownership (HJL)					−.237***		
					(.084)		
Common ownership (MHHID)						−.231***	
						(.054)	
Common ownership (MHHID 1/N)							−.142***
							(.047)
Volatility	1.149***	1.160***	1.144***	1.186***	1.185***	1.165***	1.179***
	(.275)	(.276)	(.276)	(.278)	(.277)	(.277)	(.278)
ln(market equity)	.372***	.369***	.362***	.374***	.376***	.360***	.360***
	(.020)	(.020)	(.020)	(.021)	(.021)	(.021)	(.021)

Leverage	.0257	.0268	.0353	.0296	.0288	.0301	.0300
	(.064)	(.064)	(.066)	(.065)	(.065)	(.065)	(.065)
HHI	−.124	−.125*	−.148**	−.137*	−.144*	−.216***	−.115
	(.073)	(.073)	(.070)	(.074)	(.074)	(.074)	(.073)
ln(tenure)	.492***	.492***	.498***	.489***	.490***	.488***	.488***
	(.029)	(.029)	(.029)	(.029)	(.029)	(.029)	(.029)
Institutional ownership	−.385***	−.309***	−.344***	−.294**	−.274***	−.364***	−.363***
	(.074)	(.076)	(.078)	(.079)	(.080)	(.076)	(.076)
Observations	42,492	42,492	41,178	42,492	42,492	42,498	42,498
R^2	.684	.684	.683	.683	.683	.683	.683
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry (SIC-3) × year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes

NOTE.—This table presents regressions similar to those in table 5 but in addition to $\bar{\kappa}$ uses several alternative common ownership measures described in sec. V.B. We use industry definitions based on four-digit SIC codes from CRSP. Table C4 repeats the analysis for Compustat and HP industry definitions.

* $p < .1$.

** $p < .05$.

*** $p < .01$.

TABLE 7
WPS as a Function of Common Ownership: Alternative WPS Measures

	ln(WPS JM)			ln(WPS HL)		
Dependent Variable	(1)	(2)	(3)	(4)	(5)	(6)
Common ownership (kappa)	−.167***			−.109***		
	(.045)			(.046)		
Common ownership (cosine similarity)		−.190***			−.123***	
		(.049)			(.048)	
Common ownership (top 5 overlap)			−.150***			−.076***
			(.035)			(.034)
Volatility	1.427***	1.434***	1.456***	1.616***	1.620***	1.635***
	(.268)	(.268)	(.268)	(.291)	(.292)	(.290)
Size	.0799***	.0781***	.0733***	.695***	.694***	.690***
	(.023)	(.023)	(.023)	(.023)	(.023)	(.023)
Leverage	−.553***	−.553***	−.550***	.0648	.0651	.0608
	(.062)	(.062)	(.063)	(.062)	(.062)	(.065)
HHI	−.122*	−.126*	−.149**	−.0930	−.0950	−.119*
	(.065)	(.064)	(.063)	(.069)	(.069)	(.068)
ln(tenure)	.395***	.395***	.402***	.572***	.573***	.582***
	(.025)	(.025)	(.026)	(.034)	(.034)	(.033)
Institutional ownership	−.0915	−.0303	−.0619	−.142**	−.103	−.127*
	(.057)	(.057)	(.057)	(.061)	(.062)	(.062)
Observations	42,492	42,492	41,178	42,492	42,492	41,178
R^2	.792	.792	.793	.792	.792	.794
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry (SIC-3) × year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Note.—This table presents regressions similar to those in tables 5 and 6 but uses several alternative measures of WPS. In cols. 1–3, the dependent variable is the JM measure (Jensen and Murphy 1990), while cols. 4–6 use the HL measure (Hall and Liebman 1998), both in natural logs. We use industry definitions based on four-digit SIC codes from CRSP. Table C5 repeats the analysis for Compustat and HP industry definitions.
* $p < .1$.
** $p < .05$.
*** $p < .01$.

4. Other Robustness Tests

Table 8 shows that when common ownership is higher, the WPS of top management compensation is lower, not only for CEOs but also for all top executives. The negative association between common ownership and WPS remains significant for almost all measures of common ownership, but the effect is weaker than for CEOs. One interpretation of this result is that CEOs are principally responsible for firm strategy and thus their decisions have a much greater impact on the profits of competitors than those of other top managers. Therefore, we would expect the incentive-reducing effect of common ownership to be most pronounced for CEOs.

To check robustness with respect to the relative timing of changes in common ownership and changes in WPS, in table C7 we present the coefficient estimates of the same specification as in our baseline regressions but with 1-year lags in the common ownership variables. Across all industry definitions and common ownership measures, the coefficient estimates and standard errors are very similar to our baseline regressions and are even slightly larger in magnitude for the HP industry definitions.

Finally, in table C8 we consider coarser industry definitions at the three-digit level. We again find that the relationship between WPS and common ownership is negative and statistically significant throughout. However, the magnitude of the estimated coefficients is somewhat smaller than for our baseline regressions. We hypothesize that this is due to attenuation bias because three-digit industry definitions less precisely capture the extent to which members of the defined set of competitors interact in the product market.

In sum, the baseline panel results are driven neither by the industry definition, nor by the measure of common ownership, nor by the measure of WPS we use. However, one might be concerned that sorting of executives with particular characteristics and preferences could be driving the results. For example, less aggressive CEOs might sort into firms that are held by common owners who, for unexplained reasons (i.e., other than their economic interests), also systematically offer "flatter" compensation packages. Our interpretation is not challenged by this plausible explanation: the purpose of the paper is to show that in firms whose largest owners are widely diversified, top managers receive less performance-sensitive compensation. Given that this sorting hypothesis is part of the narrative we propose, we do not intend to challenge this interpretation.

C. *Difference-in-Differences Design Using S&P 500 Additions*

There is a key difference between our panel regression analysis and our theoretical analysis. In the model, ownership is assumed to be exogenous, but in the data, ownership could be endogenous. The panel regression coefficients may therefore not have the interpretation that common ownership leads to lower managerial WPS. For example, it could be the case that unobserved expected changes in firms' product market strategies drive changes in both common ownership and the structure of executive compensation. To investigate to what extent the correlations reported so far have a causal interpretation, we employ a strategy that is based on shocks to common ownership due to index additions of competing firms. Specifically, we examine whether the negative correlation between common ownership and managerial WPS persists when we use only variation

TABLE 8
WPS as a Function of Common Ownership: All Executives

	Log(WPS EGL)						
Dependent Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Common ownership (kappa)	−.0864***						
	(.017)						
Common ownership (cosine similarity)		−.0894***					
		(.018)					
Common ownership (top 5 overlap)			−.0586***				
			(.015)				
Common ownership (AP)				−.0195			
				(.036)			
Common ownership (HJL)					−.0568*		
					(.033)		
Common ownership (MHHID)						−.0849***	
						(.019)	
Common ownership (MHHID 1/N)							−.0370**
							(.016)
Volatility	−.114	−.111	−.107	−.104	−.101	−.110	−.105
	(.152)	(.152)	(.160)	(.152)	(.152)	(.152)	(.152)

ln(market equity)	.381***	.380***	.378***	.377***	.380***	.377***	.376***
	(.011)	(.011)	(.012)	(.012)	(.011)	(.011)	(.011)
Leverage	.0840***	.0847***	.0936***	.0868***	.0864***	.0865***	.0864***
	(.028)	(.028)	(.028)	(.028)	(.028)	(.028)	(.028)
HHI	−.0631**	−.0640**	−.0549**	−.0561**	−.0633**	−.0958***	−.0563**
	(.024)	(.023)	(.025)	(.022)	(.022)	(.027)	(.024)
ln(tenure)	.300***	.300***	.305***	.298***	.299***	.299***	.299***
	(.029)	(.029)	(.029)	(.029)	(.029)	(.029)	(.029)
Institutional ownership	−.119***	−.0879***	−.101***	−.0993***	−.0839**	−.109***	−.108***
	(.028)	(.027)	(.027)	(.034)	(.034)	(.028)	(.029)
Observations	230,142	230,142	221,872	230,142	230,142	230,167	230,167
R^2	.798	.798	.797	.797	.797	.798	.797
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry (SIC-3) × year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes

NOTE.—This table presents regressions similar to those in table 6 with the sample now covering all top executives rather than only CEOs. We use industry definitions based on four-digit SIC codes from CRSP.

* $p < .1$.

** $p < .05$.

*** $p < .01$.

in common ownership that is caused by index additions of industry competitors.[28]

S&P 500 additions have been extensively used as a shock to ownership in the empirical literature over the past two decades (Afego 2017). There are two fundamental criticisms of using index inclusion as a shock to a particular firm's (common) ownership. First, firms are selected from a committee to be added to the S&P 500 and hence the decision can be somewhat affected by the recent performance of the company. Second, once the firm is added to the S&P 500, there are many confounding effects observed: the company becomes more visible and receives more attention from analysts and the media, in addition to experiencing a change in ownership. Lewellen and Lowry (2020) further note that common ownership of firms newly added to the S&P 500 increases, but institutional ownership does as well, while block ownership decreases. The change in common ownership weights of newly added firms is therefore not a suitable strategy for identifying common ownership effects.

To avoid these concerns, we employ a different identification strategy, pioneered by Boller and Scott Morton (2020). We use the addition of a stock j in the S&P 500 as a treatment shock to the common ownership weights of its industry competitors i that are already in the S&P 500. The addition does not cause a change in ownership of these index incumbent competitors; their institutional ownership and block ownership is unaffected. However, as Boller and Scott Morton (2020) show (and as we confirm in our own analysis), the common ownership weights κ_{ij} that the investors of these competitors i put on their newly added rival j do change, simply as a result of their investors adding the index entrant to their portfolios. We investigate to what extent the structure of the treated firms' executive pay packages changes when compared with control firms that are unaffected by the same index inclusion because they are not in the same industry as the newly included firm.[29]

For illustration, consider an industry with three firms (A, B, and C), two of which (A and B) are already in the S&P 500. When C is added to the

[28] Egen (2019) and Lewellen and Lowry (2020) criticize various instruments that the previous literature uses to identify firm-level effects of common ownership, in particular the addition of a firm to the S&P 500 as a treatment, the use of the BlackRock–Barclays Global Investors merger for identification of firm-level effects, institutional mergers, and Russell index reconstitutions. We do not use any of the identification techniques they scrutinize.

[29] Index additions of competitors could change short-term hedging demand for an incumbent firm's stock. However, we are not aware of evidence that competitor index additions have longer-term effects on index incumbents that would be relevant in our setting. Furthermore, such effects would confound our strategy only if these factors were also correlated with changes in WPS.

index, index funds that already own shares in A and B will be forced to buy shares in C as well. As a result, both A and B will experience an increase in common ownership weights, whereas control firms outside the industry do not experience a change in common ownership weights; C is excluded from the analysis. Given the dearth of theoretical guidance, our empirical implementation is agnostic about the particular functional form by which shareholders' economic interests in the newly added competitor change. We limit ourselves to testing whether there is an effect of a treatment with regard to whether common ownership increases.

In the period 1994–2019, we identify 379 additions to the S&P 500. Boller and Scott Morton (2020) show that the effect on peers is more pronounced when there is a true addition (the company added was not previously in the S&P 400 or S&P 600) rather than a promotion (the added company was previously in the S&P 400 or S&P 600). We therefore focus exclusively on 289 true index additions. We use a difference-in-differences approach and investigate the impact of the additions on WPS during an event window of 5 years before and after the addition. For each index addition, we identify as treated firms those that are in the same SIC-4 industry as the added firm and that are already members of the S&P 500. The control firms are those firms that are in the S&P 500 but not in the same SIC-4 industry as the added firm and that do not experience an inclusion in their industry in the same year of the inclusion event. This leaves us with 163, 179, and 151 true index additions with a sufficient number of pre- and postinclusion years for the CRSP, Compustat, and HP industry definitions, respectively.

Figure 3 shows that the index inclusion of a direct industry competitor shifts the distribution of the average kappa (left panels) and cosine similarity (right panels) of treated firms (i.e., those in the same industry that were already in the index) to the right, for all industry definitions. The average kappa and cosine similarity of the index incumbent firms are lower before (solid blue line) than after (dashed red line) the index inclusion of a direct industry competitor.

These figures, which corroborate earlier findings by Boller and Scott Morton (2020), indicate that treated companies experience an increase in common ownership when they are treated. However, we are also interested in whether treated firms experience an abnormally strong increase in common ownership when they are treated. Table C10 reports the output from regressions of the change in common ownership, as measured by cosine similarity, on a treatment dummy, as well as on firm and year fixed effects. The estimate is identified from variation within each firm in the change of common ownership. The results indicate that treated firms experience an abnormally strong increase of common ownership when they are treated, compared with other firms in the same year and compared with their usual change in common ownership in other years.

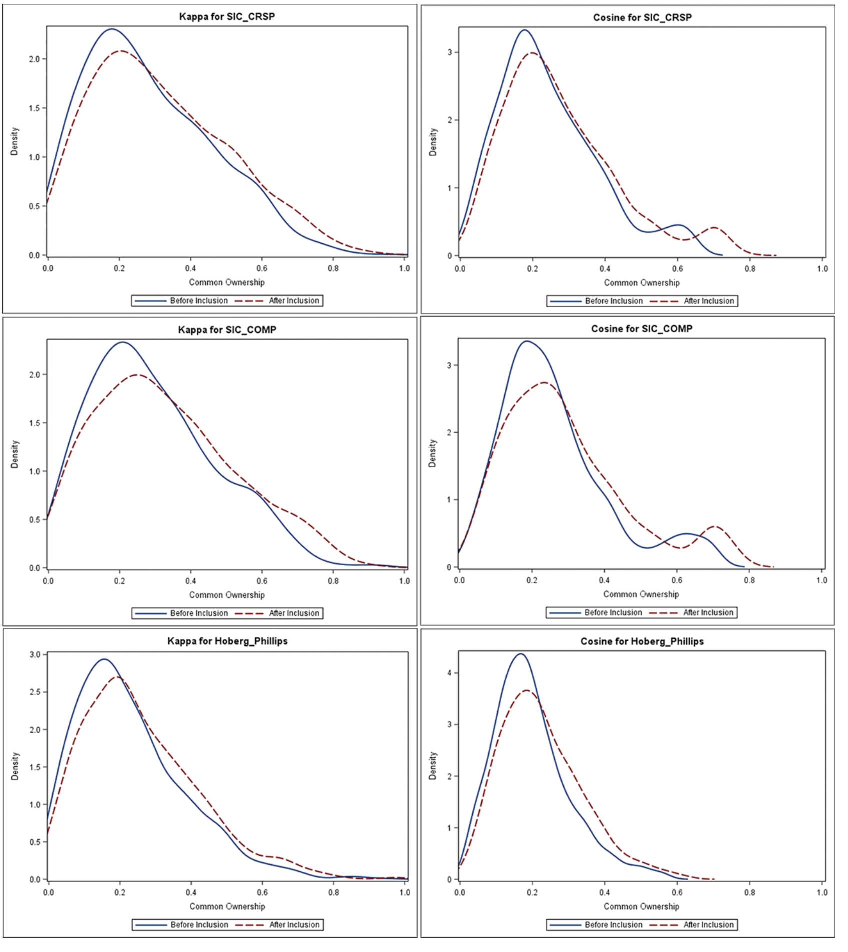

FIG. 3.—Distributions of kappa and cosine similarity before and after index inclusion of a competitor. This figure plots the distributions of kappa (left panels) and cosine similarity (right panels) before (solid blue line) and after (dashed red line) index inclusion of a competitor for four-digit CRSP (first row), Compustat (second row), and HP (third row) industry definitions.

We compare the WPS of treatment versus control firms before and after the inclusion event using the following specification:

$$\begin{aligned} \mathrm{WPS}_{ijzt} = {} & \zeta \cdot \mathrm{Treat}_{ijz_4} + \theta \cdot \mathrm{Treat}_{ijz_4} \cdot \mathrm{Post}_{xt} + \xi \cdot X_{ijz\mathrm{Pre}} + \nu \cdot X_{ijz\mathrm{Pre}} \\ & \cdot \mathrm{Post}_{xt} + \upsilon_i + \eta_t + \iota_x + \varepsilon_{ijzt}, \end{aligned} \tag{19}$$

where i indexes firms, j indexes managers (CEOs), z_4 denotes industries at the four-digit level, t indexes years, x indexes index inclusion events,

$X_{ijz\mathrm{Pre}}$ is a vector of controls measured in the year of the addition (to avoid using potentially endogenous posttreatment variation in controls), and υ_i, η_t, and ι_x are the firm, year, and inclusion fixed effects, respectively. The estimation is run on a sample with five pre- and five postyears of the event treatment year. Post_{xt} is, for any given inclusion event x, a dummy variable equal to one for the year of the inclusion event and all years after and zero for the years before. Treat_{ijz_4} is a dummy variable equal to one, for all sample years, if firm i (which is already in the index) experiences the index inclusion of a product market competitor (i.e., a firm with the same four-digit industry z_4 as firm i) during the sample period and zero otherwise. The firm being added to the index is excluded from the sample and is neither treatment nor control for the particular inclusion event.

A further explanation is in order to understand the remaining identifying variation. The key is to view every addition as a separate event. Recall the above example industry featuring firms A, B, and C. When C is added to the index, the treatment dummy takes a value of one for firms A and B, whereas it is zero for all other sample firms—for all years of the sample. If, in another industry (featuring firms X, Y, and Z), Z is added to the index in the same year as when C is added, the treatment dummy is one for X and Y but zero for all other firms—except A, B, and C, which are removed as controls because their industry experienced an inclusion in the same year. If the inclusion of Z occurs in a different year than the inclusion of C, then A, B, and C each serve as controls. As a result, there is within-firm, across-event variation in whether the firm is treated or whether it belongs to a control. Because inclusions happen in multiple years, there is also within-firm variation over time in whether it is treated. Therefore, firm and year fixed effects (υ_i and η_t) are not absorbed in the above design. Post_{xt} is a dummy that is specific to an inclusion event and therefore does not get absorbed by year fixed effects either. In contrast, any given inclusion event assigns all firms to either the treatment or the control group. Therefore, the treatment dummy is absorbed by firm fixed effects. Last, some specifications include inclusion fixed effects, ι_x. This serves the purpose of taking out potentially omitted variation across firms and over time that correlates with both WPS and the incidence of additions that may be heterogeneous across firms. The remaining variation is differences across firms in within-firm variation of common ownership over time that is due to the index inclusion of industry competitors.

Table 9 shows that following the index inclusion of a direct competitor that was previously not in the index, the WPS of CEO compensation at index incumbent firms operating in the same industry declines by 16.4% ($=e^{-0.179} - 1$). This result is estimated using the same set of controls as our panel regressions, as well as firm and year fixed effects. Columns 2, 4, and 6 report results with inclusion fixed effects, which lead to

TABLE 9
WPS as a Function of Common Ownership: Difference-in-Differences Estimation

	ln(WPS EGL)					
	SIC CRSP		SIC Compustat		HP	
Industry Definition	(1)	(2)	(3)	(4)	(5)	(6)
Treat × Post	−.179***	−.179***	−.152***	−.153***	−.107**	−.107***
	(.053)	(.047)	(.054)	(.048)	(.040)	(.032)
Post	.873***	.888***	.796***	.818***	1.047***	1.060***
	(.240)	(.128)	(.227)	(.119)	(.321)	(.135)
True inclusions of competitors	163	163	179	179	151	151
Unique treated firms	335	335	351	351	417	417
Unique control firms	807	807	837	837	709	709
R^2	.523	.523	.528	.528	.545	.546
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Inclusion fixed effects	No	Yes	No	Yes	No	Yes

Note.—This table presents the difference-in-differences estimates using S&P 500 inclusions of competitors. Firms that are already in the S&P 500 index and are in an industry that experiences an addition of a competitor firm to the S&P 500 index in a given year are the treatment group, and all other firms in different industries that did not experience an inclusion in the index are the control firms. The Post dummy takes a value of one for the event year and for the 5 years after the inclusion and takes a value of zero for the 5 years before. The controls that we use (not shown) are volatility, the natural log of market equity, leverage, HHI, and the natural log of tenure and are taken as of the preevent year. Firm and year fixed effects are included in all specifications. Standard errors are clustered two ways at the firm and year level.
** $p < .05$.
*** $p < .01$.

only small changes in the coefficient estimates. Columns 3–6 further show that these results are also very similar for alternative four-digit industry definitions based on Compustat and HP. As in our baseline estimations, the incentive-reducing effect is smallest in magnitude for the HP industry definitions, for which the decline in WPS is equal to 10.1% ($=e^{-0.107} - 1$).

Figure 4 plots the estimated effect of the index inclusion of an industry competitor on WPS over time. First, it shows that the negative effect of the index inclusion of a competitor on CEO WPS is not present before the inclusion of the competitor into the index. The preinclusion coefficient estimates are consistently insignificant. Second, it shows that the negative effect on CEO WPS is gradual. It increases in magnitude over time following the competitor's index inclusion and is consistently statistically significant for the post-competitor-inclusion years.[30]

[30] Although data limitations, industry definitions, and the complexity of multidimensional contracts make it difficult to systematically test for changes in the actual structure of compensation contracts conditional on the addition of a rival firm into the S&P 500, there is anecdotal evidence. For example, United Airlines was added to the S&P 500 in late

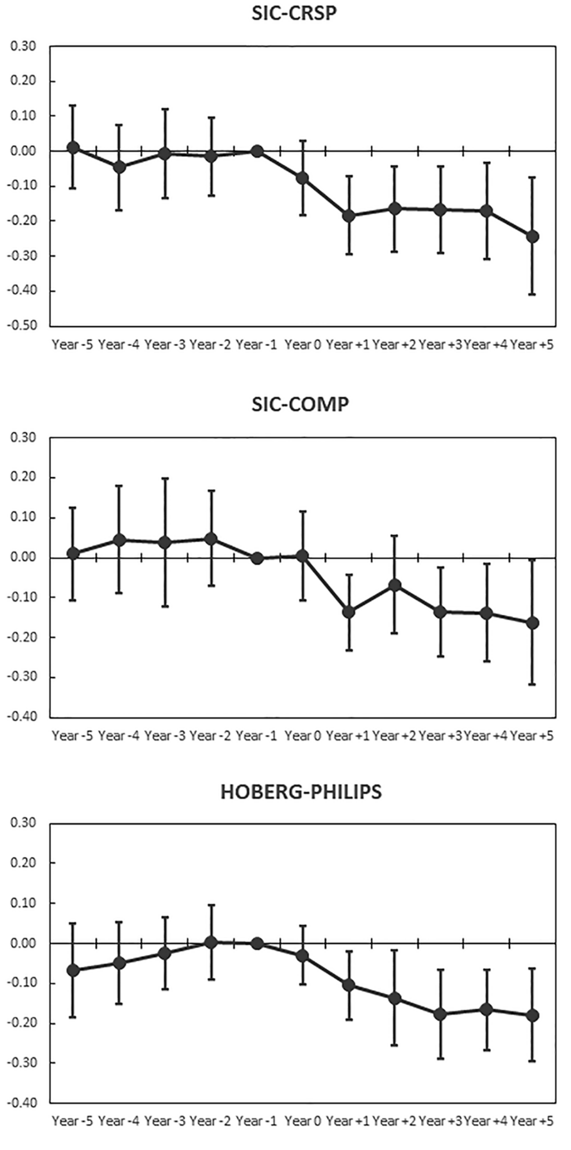

Fig. 4.—Estimated coefficients of S&P 500 inclusion treatment indicator interacted with year fixed effects on WPS. The graph plots the estimated coefficient on interactions of the treatment indicator variable with year fixed effects. We drop the interaction for the end of the year before the inclusion, and thus the effect is normalized to zero for that year. We control for volatility, natural log of market equity, leverage, HHI, and natural log of tenure, each evaluated in the year before the inclusion and interacted with year fixed effects. We also include firm and year fixed effects and double cluster standard errors at the firm and year levels.

Finally, the incentive-reducing effect of a competitor index addition is measurable only for true additions to the index, not for promotions from a similar index. Boller and Scott Morton (2020) show that such promotions are not followed by a similarly large increase in common ownership as true additions, and they do not find significant stock return reactions for these promoted companies' stock returns either. Similarly, in untabulated results we find that there is no statistically significant increase in common ownership due to promotions and that WPS does not decrease significantly for the index incumbents following the promotion of an industry competitor to the index. We view these results as an informative placebo exercise because they show that the reduction in WPS is not a mechanical consequence of the index addition of a competitor. As predicted by our theory, an associated ownership change appears to be necessary to obtain our result.

We therefore conclude that the index inclusion of a direct industry competitor increases common ownership and thereby decreases the WPS of CEO compensation. This result allays the empirical concern that endogenous ownership confounds the interpretation of the negative correlation between common ownership and managerial incentives reported in our panel regressions.

The strategy also allays the concern that other features of ownership—such as block ownership, institutional ownership, or passive ownership—could be the true drivers of our results. The ownership structure of the treated firm does not change as a result of a competitor being added to the index—only the other portfolio components of the treated firms' owners change. Therefore, these difference-in-differences results are unlikely to be driven by omitted features of firm ownership.

Another challenge to a causal interpretation is the possibility of either a strategic response or "behavioral" reasons for why "treated" firms respond with reduced WPS to a rival being added to the index. Suppose, for example, that a newly added rival's WPS decreases as a result of its addition to the index. This may occur because of greater media attention, investor following, or brand recognition, which might substitute for performance-sensitive pay. Index inclusion may also change the index entrant's own ownership and therefore its incentive structure. If the firms that are "treated" with a newly added industry rival merely respond to the newly included firm's reduced WPS, our strategy might identify a "false positive" (negative) effect of common ownership on WPS. However, we find that the WPS of the newly added firms themselves does not in fact significantly change following additions to the S&P 500 (fig. C1). Therefore, strategic or behavioral

2015. In 2016, American Airlines, which was already in the S&P 500, changed its executive compensation contract to reward profit margins (which typically decrease with quantity produced) from its earlier focus on market share and consumer satisfaction metrics. In our data, this also coincides with a reduction (starting in 2016 and continuing strongly in subsequent years) in the WPS measure.

responses of the index incumbents to changes of WPS of the newly included firms cannot explain our results.

VII. Conclusion

In this paper, we examine how shareholder portfolio interests affect optimal managerial incentive contracts under strategic product market competition. Our theoretical framework is built on standard assumptions in organizational economics and industrial organization. It provides a unified explanation for a large set of empirical facts, including that the sensitivity of top managers' wealth to their firm's performance is weaker when the firm's largest shareholders are also large shareholders of the firm's competitors. Using panel regressions and a difference-in-differences design based on competitor index inclusions, we find consistent and robust empirical support for this prediction. Firm-level common ownership has a large negative effect on the performance sensitivity of managerial incentives. We also explain why firms set different prices across different product markets in the same industry, in ways that are consistent with previous empirical evidence on common ownership.

Some of these predictions depend on the assumption that shareholders can affect the performance sensitivity only of top management incentives and that category-specific pricing decisions are delegated to middle managers. If, by contrast, investors (i) directly choose prices themselves, (ii) perfectly align the incentives of pricing specialists with their own, or (iii) centralize all multiproduct pricing decisions in the hands of the top manager and reward him based on competitors' profits, the model generates alternative predictions that do not capture all of the empirical facts. Therefore, our theoretical framework and empirical evidence can restrict the kinds of governance channels that are important for common ownership to have effects on firm behavior and product market outcomes, including firm efficiency, prices, and markups.

Our analysis shows that unilateral incentives arising from managerial compensation can be a mechanism through which common ownership influences product market competition. However, real-world competition between firms is more complex than our model assumes and than what we investigate in our empirical analysis. For example, common ownership may also affect (and be affected by) competition in input and labor markets and competition by foreign and private firms. Measuring such effects will refine our understanding of the interplay of common ownership and competition.

Finally, our results challenge the validity of a ubiquitous and fundamental assumption in industrial organization, organizational economics, and corporate finance that has rarely been examined. The fact that firms' ownership structures and shareholders' competitive preferences affect the structure of managerial incentives suggests that a firm's behavior and objectives depend on who owns the firm. Our model assumes an alternative objective function that is useful in organizing a set of empirical facts. It also provides an answer to the question of how the interests of owners trickle down through complex hierarchical organizations and "affect those making pricing decisions throughout the organization." Our findings may motivate future studies that test hypotheses derived from alternative firm objective functions and that recognize the organizational structures of competitors.

References

Afego, Pyemo N. 2017. "Effects of Changes in Stock Index Compositions: A Literature Survey." *Internat. Rev. Financial Analysis* 52:228–39.

Aggarwal, Rajesh, and Andrew Samwick. 1999. "Executive Compensation, Strategic Competition, and Relative Performance Evaluation: Theory and Evidence." *J. Finance* 54 (6): 1999–2043.

Alonso, Ricardo, Wouter Dessein, and Niko Matouschek. 2008. "When Does Coordination Require Centralization?" *A.E.R.* 98 (1): 145–79.

———. 2015. "Organizing to Adapt and Compete." *American Econ. J. Microeconomics* 7 (2): 158–87.

Antón, Miguel, Florian Ederer, Mireia Giné, and Martin Schmalz. 2016. "Common Ownership and Relative Performance Evaluation." Working paper, Yale School Management, New Haven, CT.

———. 2018. "Innovation: The Bright Side of Common Ownership?" Working paper.

Antón, Miguel, and Christopher Polk. 2014. "Connected Stocks." *J. Finance* 69 (3): 1099–127.

Aslan, Hadiye. 2019. "Common Ownership, Creative Destruction, and Inequality: Evidence from U.S. Consumers." Working paper.

Azar, José. 2016. "Portfolio Diversification, Market Power, and the Theory of the Firm." Working paper.

Azar, José, Sahil Raina, and Martin Schmalz. 2021. "Ultimate Ownership and Bank Competition." *Financial Management* 51 (1): 227–69.

Azar, José, Martin Schmalz, and Isabel Tecu. 2018. "Anticompetitive Effects of Common Ownership." *J. Finance* 73 (4): 1513–65.

Azar, José, and Xavier Vives. 2021. "General Equilibrium Oligopoly and Ownership Structure." *Econometrica* 89 (3): 999–1048.

Backus, Matthew. 2020. "Why Is Productivity Correlated with Competition?" *Econometrica* 88 (6): 2415–44.

Backus, Matthew, Christopher Conlon, and Michael Sinkinson. 2019. "The Common Ownership Hypothesis: Theory and Evidence." Working paper, Brookings Inst., Washington, DC.

———. 2020. "Theory and Measurement of Common Ownership." *American Econ. Assoc. Pap. and Proc.* 110:557–60.

———. 2021a. "Common Ownership and Competition in the Ready-to-Eat Cereal Industry." Working Paper no. 28350, NBER, Cambridge, MA.

———. 2021b. "Common Ownership in America: 1980–2017." *American Econ. J. Microeconomics* 13 (3): 273–308.

Baker, George P., and Brian J. Hall. 2004. “CEO Incentives and Firm Size.” *J. Labor Econ.* 22 (4): 767–98.
Bandiera, Oriana, Andrea Prat, Stephen Hansen, and Raffaella Sadun. 2020. “CEO Behavior and Firm Performance.” *J.P.E.* 128 (4): 1325–69.
Bebchuk, Lucian A., Alma Cohen, and Scott Hirst. 2017. “The Agency Problems of Institutional Investors.” *J. Econ. Perspectives* 31 (3): 89–102.
Bebchuk, Lucian A., and Jesse Fried. 2006. *Pay without Performance*. Cambridge, MA: Harvard Univ. Press.
Bebchuk, Lucian A., and Scott Hirst. 2019. “Index Funds and the Future of Corporate Governance: Theory, Evidence, and Policy.” *Columbia Law Rev.* 119 (8): 2029–146.
Ben-David, Itzhak, Francesco Franzoni, Rabih Moussawi, and John Sedunov. 2020. “The Granular Nature of Large Institutional Investors.” *Management Sci.* 67 (11): 6629–7289.
Bertrand, Marianne, and Sendhil Mullainathan. 2000. “Agents with and without Principals.” *A.E.R.* 90 (2): 203–8.
———. 2001. “Are CEOs Rewarded for Luck? The Ones without Principals Are.” *Q.J.E.* 116 (3): 901–32.
———. 2003. “Enjoying the Quiet Life? Corporate Governance and Managerial Preferences.” *J.P.E.* 111 (5): 1043–75.
Bloom, Nicholas, Erik Brynjolfsson, Lucia Foster, Ron Jarmin, Megha Patnaik, Itay Saporta-Eksten, and John Van Reenen. 2019. “What Drives Differences in Management Practices?” *A.E.R.* 109 (5): 1648–83.
Bloom, Nicholas, Scott W. Ohlmacher, Cristina J. Tello-Trillo, and Melanie Wallskog. 2021. “Pay, Productivity and Management.” Working Paper no. 29377, NBER, Cambridge, MA.
Bloom, Nicholas, Raffaella Sadun, and John Van Reenen. 2012a. “Americans Do IT Better: US Multinationals and the Productivity Miracle.” *A.E.R.* 102 (1): 167–201.
———. 2012b. “The Organization of Firms across Countries.” *Q.J.E.* 127 (4): 1663–705.
Bloom, Nicholas, and John Van Reenen. 2007. “Measuring and Explaining Management Practices across Firms and Countries.” *Q.J.E.* 122 (4): 1351–408.
Boller, Lysle, and Fiona Scott Morton. 2020. “Testing the Theory of Common Stock Ownership.” Working Paper no. 27515, NBER, Cambridge, MA.
Bresnahan, Timothy F., and Steven C. Salop. 1986. “Quantifying the Competitive Effects of Production Joint Ventures.” *Internat. J. Indus. Org.* 4 (2): 155–75.
Brito, Duarte, António Osório, Ricardo Ribeiro, and Helder Vasconcelos. 2018. “Unilateral Effects Screens for Partial Horizontal Acquisitions: The Generalized HHI and GUPPI.” *Internat. J. Indus. Org.* 59:127–89.
Broccardo, Eleonora, Oliver Hart, and Luigi Zingales. 2020. “Exit vs. Voice.” Working Paper no. 27710, NBER, Cambridge, MA.
Bubb, Ryan, and Emiliano Catan. 2018. “The Party Structure of Mutual Funds.” Working paper.
Coffee, John C. 2020. “The Future of Disclosure: ESG, Common Ownership, and Systematic Risk.” Working paper, Columbia Law School, New York.
Coles, Jeffrey L., Zhichuan Li, and Albert Y. Wang. 2018. “Industry Tournament Incentives.” *Rev. Financial Studies* 31 (4): 1418–59.
Condon, Madison. 2020. “Externalities and the Common Owner.” *Washington Law Rev.* 95 (1): 81.
Cuñat, Vicente, and Maria Guadalupe. 2005. “How Does Product Market Competition Shape Incentive Contracts?” *J. European Econ. Assoc.* 3 (5): 1058–82.

———. 2009. “Globalization and the Provision of Incentives inside the Firm: The Effect of Foreign Competition.” *J. Labor Econ.* 27 (2): 179–212.
Cziraki, Peter, and Dirk Jenter. 2021. “The Market for CEOs.” CEPR Discussion Paper no. DP16281, Centre Econ. Policy Res., London.
D’Aspremont, Claude, and Alexis Jacquemin. 1988. “Cooperative and Noncooperative R&D in Duopoly with Spillovers.” *A.E.R.* 78 (5): 1133–37.
Drèze, Jacques H. 1974. “Investment under Private Ownership: Optimality, Equilibrium and Stability.” In *Allocation under Uncertainty: Equilibrium and Optimality*, 129–66. Barcelona: Internat. Econ. Assoc.
Ederer, Florian, and Bruno Pellegrino. 2021. “A Tale of Two Networks: Common Ownership and Product Market Rivalry.” Working paper.
Edgeworth, Francis Ysidro. 1881. *Mathematical Psychics: An Essay on the Application of Mathematics to the Moral Sciences*, vol. 10. London: Kegan Paul.
Edmans, Alex, and Xavier Gabaix. 2016. “Executive Compensation: A Modern Primer.” *J. Econ. Literature* 54 (4): 1232–87.
Edmans, Alex, Xavier Gabaix, and Augustin Landier. 2009. “A Multiplicative Model of Optimal CEO Incentives in Market Equilibrium.” *Rev. Financial Studies* 22 (12): 4881–917.
Egen, Eyub. 2019. “Common-Ownership and Portfolio Rebalancing.” Working paper.
Elhauge, Einer. 2016. “Horizontal Shareholding.” *Harvard Law Rev.* 109:1267–317.
European Competition Commission. 2017. “Commission Decision M.7932—Dow/DuPont.” Report, European Competition Commission. https://ec.europa.eu/competition/mergers/cases/decisions/m7932_13668_3.pdf.
Fee, C. Edward, and Charles J. Hadlock. 2003. “Raids, Rewards, and Reputations in the Market for Managerial Talent.” *Rev. Financial Studies* 16 (4): 1315–57.
Fershtman, Chaim, and Kenneth L. Judd. 1987. “Equilibrium Incentives in Oligopoly.” *A.E.R.* 77 (5): 927–40.
FTC (Federal Trade Commission). 2018. *Competition and Consumer Protection in the 21st Century*. Hearing, Fed. Trade Commission, December 6. Washington, DC: For Record. https://www.ftc.gov/system/files/documents/public_events/1422929/ftc_hearings_session_8_transcript_12-6-18_0.pdf.
Gabaix, Xavier, and Augustin Landier. 2008. “Why Has CEO Pay Increased So Much?” *Q.J.E.* 123 (1): 49–100.
Gibbons, Robert, and Kevin J. Murphy. 1992. “Optimal Incentive Contracts in the Presence of Career Concerns: Theory and Evidence.” *J.P.E.* 100 (3): 468–505.
Gilje, Erik P., Todd A. Gormley, and Doron Levit. 2020. “Who’s Paying Attention? Measuring Common Ownership and Its Impact on Managerial Incentives.” *J. Financial Econ.* 137 (1): 152–78.
Giroud, Xavier, and Holger M. Mueller. 2010. “Does Corporate Governance Matter in Competitive Industries?” *J. Financial Econ.* 95 (3): 312–31.
———. 2011. “Corporate Governance, Product Market Competition, and Equity Prices.” *J. Finance* 66 (2): 563–600.
Grossman, Sanford J., and Oliver Hart. 1979. “A Theory of Competitive Equilibrium in Stock Market Economies.” *Econometrica* 47 (2): 293–329.
Gutiérrez, Germán, and Thomas Philippon. 2018. “Ownership, Concentration, and Investment.” *American Econ. Assoc. Papers and Proc.* 108:432–37.
Häckner, Jonas. 2000. “A Note on Price and Quantity Competition in Differentiated Oligopolies.” *J. Econ. Theory* 93 (2): 233–39.
Hall, Brian J., and Jeffrey B. Liebman. 1998. “Are CEOs Really Paid like Bureaucrats?” *Q.J.E.* 113 (3): 653–91.

Harford, Jarrad, Dirk Jenter, and Kai Li. 2011. "Institutional Cross-Holdings and Their Effect on Acquisition Decisions." *J. Financial Econ.* 99 (1): 27–39.

Hart, Oliver. 1983. "The Market Mechanism as an Incentive Scheme." *Bell J. Econ.* 14:366–82.

Hart, Oliver, and Luigi Zingales. 2017. "Companies Should Maximize Shareholder Welfare Not Market Value." *J. Law, Finance, and Accounting* 2 (2): 247–74.

Hartzell, Jay C., and Laura T. Starks. 2003. "Institutional Investors and Executive Compensation." *J. Finance* 58 (6): 2351–74.

Heath, Davidson, Daniele Macciocchi, Roni Michaely, and Matthew Ringgenberg. 2020. "Do Index Funds Monitor?" *Rev. Financial Studies* 35 (1): 91–131.

Hemphill, Scott, and Marcel Kahan. 2020. "The Strategies of Anticompetitive Common Ownership." *Yale Law J.* 129 (5): 1276–599.

Hicks, John R. 1935. "Annual Survey of Economic Theory: The Theory of Monopoly." *Econometrica* 3 (1): 1–20.

Hoberg, Gerard, and Gordon Phillips. 2010. "Product Market Synergies and Competition in Mergers and Acquisitions: A Text-Based Analysis." *Rev. Financial Studies* 23 (10): 3773–811.

———. 2016. "Text-Based Network Industries and Endogenous Product Differentiation." *J.P.E.* 124 (5): 1423–65.

Holmstrom, Bengt. 1982. "Moral Hazard in Teams." *Bell J. Econ.* 13 (2): 324–40.

Holmstrom, Bengt, and Paul Milgrom. 1987. "Aggregation and Linearity in the Provision of Intertemporal Incentives." *Econometrica* 55 (2): 303–28.

Jensen, Michael, and Kevin J. Murphy. 1990. "Performance Pay and Top-Management Incentives." *J.P.E.* 98 (2): 225–64.

Joh, Sung Wook. 1999. "Strategic Managerial Incentive Compensation in Japan: Relative Performance Evaluation and Product Market Collusion." *Rev. Econ. and Statis.* 81 (2): 303–13.

Kamien, Morton I., Eitan Muller, and Israel Zang. 1992. "Research Joint Ventures and R&D Cartels." *A.E.R.* 82 (5): 1293–306.

Kedia, Simi. 1998. "Product Market Competition and Top Management Compensation." Working paper.

Koch, Andrew, Marios Panayides, and Shawn Thomas. 2020. "Common Ownership and Competition in Product Markets." *J. Financial Econ.* 139 (1): 109–37.

Krueger, Philipp, Zacharias Sautner, and Laura T. Starks. 2020. "The Importance of Climate Risks for Institutional Investors." *Rev. Financial Studies* 33 (3): 1067–111.

Lewellen, Katharina, and Michelle Lowry. 2020. "Does Common Ownership Really Increase Firm Coordination?" *J. Financial Econ.* 141 (1): 322–44.

Lo, Desmond, Wouter Dessein, Mrinal Ghosh, and Francine Lafontaine. 2016. "Price Delegation and Performance Pay: Evidence from Industrial Sales Forces." *J. Law, Econ., and Org.* 32 (3): 508–44.

López, Ángel L., and Xavier Vives. 2019. "Overlapping Ownership, R&D Spillovers, and Antitrust Policy." *J.P.E.* 127 (5): 2394–437.

Matvos, Gregor, and Michael Ostrovsky. 2008. "Cross-Ownership, Returns, and Voting in Mergers." *J. Financial Econ.* 89:391–403.

Moskalev, Alexandr. 2020. "Objective Function of a Non-price-taking Firm with Heterogeneous Shareholders." PhD diss., Univ. Michigan, Ann Arbor.

Murphy, Kevin J. 1999. "Executive Compensation." In *Handbook of Labor Economics*, vol. 3, edited by O. Ashenfelter and D. Card, 2485–563. Amsterdam: North-Holland.

Newham, Melissa, Jo Seldeslachts, and Albert Banal-Estanol. 2019. "Common Ownership and Market Entry: Evidence from Pharmaceutical Industry." Discussion paper, German Inst. Econ. Res., Berlin.

O'Brien, Daniel P., and Steven C. Salop. 2000. "Competitive Effects of Partial Ownership: Financial Interest and Corporate Control." *Antitrust Law J.* 67 (3): 559–614.

OECD (Organization for Economic Cooperation and Development). 2017. "Common Ownership by Institutional Investors and Its Impact on Competition." Report, Org. Econ. Cooperation and Development, Paris. https://one.oecd.org/document/DAF/COMP(2017)10/en/pdf.

Oehmke, Martin, and Marcus M. Opp. 2019. "A Theory of Socially Responsible Investment." CEPR Discussion Paper no. DP14351, Centre Econ. Policy Res., London.

Olson, Bradley, and Lynn Cook. 2017. "Wall Street Tells Frackers to Stop Counting Barrels, Start Making Profits." *Wall Street Journal*, December 13. https://www.wsj.com/articles/wall-streets-fracking-frenzy-runs-dry-as-profits-fail-to-materialize-1512577420.

Park, Alex Haerang, and Kyoungwon Seo. 2019. "Common Ownership and Product Market Competition: Evidence from the US Airline Industry." *Korean J. Financial Studies* 48 (5): 617–40.

Petersen, Mitchell A. 2009. "Estimating Standard Errors in Finance Panel Data Sets: Comparing Approaches." *Rev. Financial Studies* 22 (1): 435–80.

Piccolo, Alessio, and Jan Schneemeier. 2020. "Ownership and Competition." Working paper.

Raith, Michael. 2003. "Competition, Risk and Managerial Incentives." *A.E.R.* 93:1425–36.

Rantakari, Heikki. 2008. "Governing Adaptation." *Rev. Econ. Studies* 75 (4): 1257–85.

Rotemberg, Julio. 1984. "Financial Transaction Costs and Industrial Performance." Working paper, Massachusetts Inst. Tech. Sloan School Management, Cambridge, MA.

Ruiz-Pérez, Alexandro. 2019. "Market Structure and Common Ownership: Evidence from the US Airline Industry." Working paper, Center Monetary and Financial Studies, Madrid.

Schmalz, Martin. 2018. "Common Ownership Concentration and Corporate Conduct." *Ann. Rev. Financial Econ.* 10:413–48.

———. 2021. "Recent Studies on Common Ownership, Firm Behavior, and Market Outcomes." *Antitrust Bull.* 66 (1): 12–38.

Schmidt, Cornelius, and Ruediger Fahlenbrach. 2017. "Do Exogenous Changes in Passive Institutional Ownership Affect Corporate Governance and Firm Value?" *J. Financial Econ.* 124 (2): 285–306.

Schwartz-Ziv, Miriam, and Ekaterina Volkova. 2021. "Is Blockholder Diversity Detrimental?" Working paper.

Scott Morton, Fiona, and Herbert Hovenkamp. 2017. "Horizontal Shareholding and Antitrust Policy." *Yale Law J.* 127 (7): 1742–2203.

Shekita, Nathan. 2021. "Interventions by Common Owners." *J. Competition Law and Econ.* 18 (1): 99–134.

Singh, Nirvikar, and Xavier Vives. 1984. "Price and Quantity Competition in a Differentiated Duopoly." *RAND J. Econ.* 15 (4): 546–54.

Sklivas, Steven D. 1987. "The Strategic Choice of Managerial Incentives." *RAND J. Econ.* 18 (3): 452–58.

Solomon, Steven Davidoff. 2016. "Rise of Institutional Investors Raises Questions of Collusion." *New York Times*, April 12. https://www.nytimes.com/2016/04/13/business/dealbook/rise-of-institutional-investors-raisesquestions-of-collusion.html.

Syverson, Chad. 2011. "What Determines Productivity?" *J. Econ. Literature* 49 (2): 326–65.
Taggart, Steve. 2016. "Virgin America Continues Disruption in the Travel Industry." *Loyalty 360,* July 7. https://loyalty360.org/content-gallery/daily-news/virgin-america-continues-disruption-in-the-travel.
Tirole, Jean. 1986. "Hierarchies and Bureaucracies: On the Role of Collusion in Organizations." *J. Law, Econ., and Org.* 2 (2): 181–214.
Torshizi, Mohammad, and Jennifer Clapp. 2019. "Price Effects of Common Ownership in the Seed Sector." *Antitrust Bull.* 66 (1): 39–67.
Vestager, Margrethe. 2018. "Competition in Changing Times." Report, European Commission, Brussels. https://ec.europa.eu/commission/commissioners/2014-2019/vestager/announcements/competition-changing-times-0_en.
Vickers, John. 1985. "Delegation and the Theory of the Firm." *Econ. J.* 95:138–47.
Xie, Jin, and Joseph Gerakos. 2020. "The Anticompetitive Effects of Common Ownership: The Case of Paragraph IV Generic Entry." *American Econ. Assoc. Papers and Proc.* 110:569–72.