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Committee Secretary
Standing Committee on Economics
PO Box 6021
Parliament House
Canberra ACT 2600

By email: economics.reps@aph.gov.au

Dear Committee Secretary,

Inquiry into the implications of common ownership and capital concentration in Australia

Vanguard Investments Australia welcomes the opportunity to provide a submission to the House of Representatives Standing Committee on Economics' Inquiry into the implications of common ownership and capital concentration.

As a global asset manager this submission outlines our perspective and experience as a steward for the investment and retirement assets of millions of investors. We have a history of advocating for individual investors through our contributions to academic debate, participation in industry consultations and government inquiries.

Vanguard's global Investment Strategy Group has researched the implications of common ownership extensively and we have a wealth of information, practical experience, and relevant insights from academic studies to share with the Committee.

In Australia, Vanguard has been serving financial advisers, retail clients and institutional investors with managed funds and Exchange Traded Funds (ETFs) for more than 25 years. We are also currently building a superannuation fund to offer Australians a low-cost superannuation solution that leverages Vanguard's global investment and retirement expertise.

Our core purpose is to take a stand for investors, to treat them fairly, and to give them the best chance of investment success, underscoring an unwavering focus on investor value. A core investment philosophy at Vanguard is that investors are best served by a broadly diversified portfolio including

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appropriate allocations across local and international shares and bonds. Common ownership is a fundamental fact of holding a broadly diversified portfolio that provides investors market returns at a very low cost.

Vanguard's historical journey is a compelling case study as to how the benefits of investment scale have the potential to flow through to individual investors - including Australian households and superannuation fund members - in the form of lower product fees, efficient exposure to markets, and better net return outcomes.

According to Vanguard's estimates, without index funds and the trend toward low-cost investing, Australian investors would have paid $4.1 billion in additional investment costs since 2005.[1]

Vanguard's view on common ownership

The terms of reference for the Inquiry refer to two broad factors at play in Australia's equity markets – 'capital concentration' and 'common ownership'. Whilst to some extent these are inter-related, our particular concern is with the second concept, that of 'common ownership', which has come to have some specific connotations in international academic research and public policy circles over recent years.

Specifically, certain academic studies on discrete US industries in the mid-2010s gave rise to the 'common ownership theory', purporting to establish a connection between institutional ownership of small, non-controlling stakes in competing companies in concentrated industries and reduced competition in those industries, resulting in negative impacts on consumers (for example through higher airline prices or less competitive bank interest rates).

However, subsequent reviews of this early research and additional academic studies, including Vanguard's own detailed analysis, highlight fundamental flaws in underlying assumptions underpinning the common ownership theory as well as the modelling and methodology that purport to link common ownership and reduced competition.

Our review of this unsettled academic debate, combined with our substantial practical experience managing assets in a wide variety of contexts, does not find any conclusive evidence to support the hypothesis. Consequently, we believe concerns that common ownership by asset managers diminishes competition in concentrated industries are misplaced and any regulatory intervention to curtail common ownership would likely have severe adverse consequences for investors.

In this submission, we detail key flaws of the common ownership theory in general, and more specifically as it applies to our own organisation and to comparable investment management organisations.

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[1] This figure reflects the difference between the cumulative expense ratio fees paid by investors in Australian registered Australian invested open-ended mutual funds and ETFs versus what they hypothetically would have paid if index funds did not exist. Investor savings are calculated as: (asset-weighted expense ratio of actively managed funds x industry assets) - (industry asset-weighted expense ratio x industry assets). The savings are estimated using data from Morningstar, Inc. from January 1, 2005 to December 31, 2020.

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Our key points are:

- Vanguard is a fiduciary that manages assets on behalf of over 30 million investors worldwide. We offer a diverse selection of cost-effective, high performing managed funds and exchange-traded funds, predominantly passive index funds.

- In aggregate, the broadly diversified investment funds we offer and manage on behalf of our clients hold stakes in nearly every listed company in a given industry solely for purposes of investment. This clearly differentiates our funds from activist or control-seeking investors. However, proponents of the common ownership theory routinely and erroneously conflate the asset management activities of firms like Vanguard with those fundamentally different investor types.

- Millions of investors benefit greatly from the ability to build broadly diversified investment portfolios at low cost. Common ownership is an outcome of this diversification. Common ownership theories overstate the influence that managers have over portfolio companies and fail to recognise the structure and accountability mechanisms of institutional asset management.

- Encouraging or enabling anticompetitive behaviour in concentrated industries is not a motive for asset managers and is, in fact, inimical to the objectives those managers seek to achieve. Encouraging or enabling anticompetitive behaviour by specific companies would be illogical and would likely have negative impacts on other companies and industries in which Vanguard funds also invest (for example, entities that are downstream customers of or upstream suppliers to airlines or banks). This is distinctly different from market participants who may make targeted investment decisions with a primary aim of exerting influence and control.

- In line with other markets, Vanguard's Australian funds are subject to extensive regulatory requirements that require disclosure of aggregate beneficial interest at a group level. Even collectively, our funds are minority shareholders in the companies in which they invest and never seek to exercise control.

- To meet our fiduciary duty to our clients Vanguard is focused on sustainable, long-term value creation and risk management across each and every company and industry sector in which our funds invest, not a vague notion of combined industry performance.

- As an asset manager, Vanguard's engagements with companies on behalf of our clients focus on corporate governance and material risk oversight matters, not day-to-day or strategic business decisions including pricing decisions.

- Ultimately, our practical experience as an asset manager offering broadly diversified investment funds- together with the growing academic research into common ownership- delivers no conclusive evidence suggesting that anticompetitive behaviour is an intended or unintended consequence of common ownership.

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Examining the common ownership theory

In the attached literature review (Appendix A), we summarise the key conclusions of academic research papers on both sides of the common ownership debate from Australia and internationally. This review includes an analysis of the recent paper published by Leigh & Triggs (2021) on the implications of common ownership of Australian listed companies, which we understand to have been one of the catalysts for the Committee's Inquiry.[2]

As can be seen, we believe that the analysis and findings in Leigh & Triggs' paper should be considered with caution, due to a combination of methodological limitations and the absence of citations reflecting the full spectrum of academic perspectives on the topic.

We also summarise recent international academic research, which reflects no consensus even on the question of how to measure common ownership, let alone whether it has any detrimental effect. For example, while early papers used market concentration metrics in a specific industry (e.g., airlines or banks alone) the trend has been towards a more whole-of-market approach to assess the impacts (or otherwise) of common ownership on competition within industries. This includes a large-scale quantitative study undertaken by Vanguard's global Investment Strategy Group in 2019 (Appendix B), which found no conclusive evidence of anticompetitive effects across a sample of more than 3,000 US companies in around 200 discrete industries (representing ~98% of US market capitalisation) over a 21-year period. [3]

Leaving aside our own research (and that of other investment managers who may be seen to have a vested interest), recent independent research increasingly casts doubt on the assumption that common ownership leads to anti-competitive outcomes for consumers. Indeed, these recent papers include an adjusted view by one of the most prominent original proponents of the common ownership theory, who now concludes that consumer prices in the airline industry have in fact *declined*, not increased, in tandem with a growth in common ownership by such investors. The authors argue that, under certain assumptions, economy wide (i.e., inter-industry) common ownership creates positive externalities which overcompensate higher prices due to intra-industry common ownership, such that the net effect on consumer prices is negative.[4]

A recent research paper from an Australian legal researcher, Professor Jennifer Hill, adds a further contribution to the debate. Hill highlights three contradictory narratives underpinning the claims of proponents of the common ownership theory - the "lazy investor narrative", the "anticompetitive pressure model", and the "mindreading model".[5] The third of these three categories is to our mind especially problematic, as it appears to hold that no actual evidence of anti-competitive motivation or outcomes is necessary; in this view the mere hypothetical *potential*

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[2] Leigh, Andrew, Adam Triggs, 2021. Common Ownership of Competing Firms: Evidence from Australia.
[3] Wang, Haifeng, Jan-Carl Plagge, James J. Rowley Jr., and Roger A. Aliaga-Díaz, 2019. Common ownership and industry profitability: A cross-industry view.
[4] Azar, José, and Xavier Vives, 2021. Revisiting the Anticompetitive Effects of Common Ownership.
[5] Hill, Jennifer G., 2020. The conundrum of common ownership. Vanderbilt Journal of Transnational Law, 53(3), 881-906.

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for corporate managers to respond to unstated or unintended signals from investors is supposedly sufficient to warrant a regulatory response.

In short, Vanguard submits that the common ownership theory reflects an unproven hypothesis. We do, however, appreciate the public interest in how institutional asset management works, and how major investment firms like Vanguard manage the aggregate investment positions of a range of funds with millions of individual investors.

The remainder of our submission addresses these issues under the key headings, 'The benefits of diversification'; 'Investment stewardship and fiduciary duty'; and 'Existing regulatory framework'.

The benefits of diversification

The majority of assets that Vanguard manages on behalf of our clients are invested in broadly diversified index funds that provide investors exposure to an investment market by tracking the performance of an index. These funds are passively managed, with proportional investment reflecting the weight of each company in the market index tracked.

Common ownership within investor portfolios, and in aggregate at the asset manager level, is a by-product of the diversification inherent in index investing and a fundamental principle for investment success.

We believe the growth of indexing is perhaps one of the most significant changes to asset management in the past 30 years. Indexing has brought remarkable value to tens of millions of investors worldwide. The benefits of indexing to investors are numerous and clear: low costs, consistent relative performance and broad diversification.

The growth of index funds has been driven by the growth of investors' portfolios and increased preference for low cost strategies, democratising investing for the benefit of millions of individual investors.

Far from serving to disempower individual investors, low cost indexed investments such as Exchange Traded Funds (ETFs) have in fact allowed those investors to participate in markets in a much more accessible way than was previously possible.

Keeping costs low has been an important way that we have helped investors achieve their financial and retirement goals. We continue to deliver this benefit to our investors globally.

We are an all-the-time, across-the-board low-cost provider. On average in Australia, Vanguard's fees are 0.29 per cent versus an industry average of 0.81 per cent. (Source: Morningstar)

Through an ongoing commitment to cost reduction, over the past 10 years alone Vanguard has delivered more than 40 fee cuts across our growing range of index and active investment offerings for Australian investors. According to Vanguard estimates, without index funds and the trend toward low-

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cost investing, Australian investors would have paid $4.1 billion in additional investment costs since 2005.

Moreover, indexed investing strategies in general serve to promote the retention of corporate value in public markets. This creates greater diversification benefits both within and between different sectors, especially in economies like Australia which already have relatively high degress of concentration in certain key sectors.

Investment stewardship and fiduciary duty

Managed funds – including index funds and ETFs that passively invest in equity securities – will virtually always, as part of the fund's investment strategy, hold investment positions in more than one publicly listed company competing in the same sector.

In relation to such investments, the responsible entities or managers of these funds (including Vanguard) owe fiduciary duties to their investors including to promote their best financial interests.

This requires a certain level of engagement with the companies that the funds hold, which we refer to as “Stewardship”.

While investment stewardship activities (such as proxy voting and engagement) may differ among our index and actively managed funds, our fiduciary duty to manage investments in the best interest of clients compels us to advocate, engage and vote for good corporate governance practices at the companies in which our funds invest to preserve and ideally enhance the long-term investment returns of our funds’ investors. We undertake these activities, not on our own behalf, but on behalf of our funds and the millions of investors we serve.

The discharge of the stewardship role may involve Vanguard as the responsible entity or as a manager delegated voting authority by its institutional clients:

- holding discussions or meetings about voting at a specific or proposed meeting of an entity;
- discussing issues about the entity;
- discussing possible matters to be raised with the entity’s board;
- discussing and exchanging views on a resolution to be voted on at a meeting.

While our funds’ investment stewardship program has matured significantly over the years., our commitment to a key set of principles anchored in the protection of long-term shareholder value has been consistent over time. Likewise, our commitment to abstain from inserting ourselves into matters of day-to-day management and avoiding any conflicts of interest with our own commercial interest, have remained resolute.

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Vanguard's Investment Stewardship team represents the long-term interests of investors in our funds by advocating for high standards of corporate governance around the world, engaging with company boards and leaders on governance practices, and voting proxy ballots.

Because our index funds are practically permanent owners of portfolio companies, we seek to ensure that companies provide consistently comparable disclosure of their long-term strategy and the associated material risks to long-term value. Our engagements with companies on specific issues are predicated on a fiduciary stance, not an ideological one.

All of Vanguard's proxy voting decisions are publicly disclosed on our website[6], and we publish a detailed Annual Report[7] highlighting key themes and trends of our global stewardship program. These stewardship activities are at the forefront of accepted best practice in asset managers' interactions with investee companies, and do not stray into the realm of strategic oversight or micro-management of companies' core commercial affairs, matters which remain squarely on the shoulders of Boards and company executives.

Existing regulatory framework

There exists a robust legal and regulatory framework in Australia for asset managers governing competition, licensing, fiduciary duty, stewardship and conduct.

Vanguard Investments Australia, as a responsible entity, is governed by the Corporations Act and regulated by ASIC. The Corporations Act imposes on a responsible entity a number of legal and regulatory obligations which govern the stewardship role undertaken by responsible entities in relation to their ownership holdings in publicly listed companies.

These legal and regulatory obligations and considerations provide guidelines for a responsible entity to engage in stewardship without influencing the strategy or day-to-day operations of an investee company.

In particular, the Corporations Act requires the responsible entity when undertaking the stewardship role to (among other things):

- exercise the degree of care and diligence that a reasonable person would exercise if they were in the responsible entity's position; and
- act in the best interests of the members of the managed investment scheme and, if there is a conflict between the members' interests and the responsible entity's own interests, give priority to the members' interests. (See section 601FC of the Corporations Act)

[6] How our funds voted: https://www.vanguard.com.au/personal/en/how-our-funds-voted
[7] Vanguard Investment Stewardship 2020 Annual Report: https://intl.assets.vgdynamic.info/intl/australia/documents/invest-stewardship/inv-stew-annual-report-dec-2020.pdf

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In addition to the above specific regulatory requirements applicable to a responsible entity, there are other general Corporations Act provisions that will also be applicable to a responsible entity in carrying out the stewardship role, including:

- the takeover and substantial holding provisions;
- the prohibition on insider trading;
- the regulation of shadow directors;
- the prohibition on misleading and deceptive conduct; and
- legal obligations in relation to the handling of confidential information.

The above regulatory regime operates to effectively restrict a responsible entity's stewardship activities from influencing investment decisions, market behaviour and competition.

In addition to the above, responsible entities like all body corporates are subject to the Competition and Consumer Act, which prohibits anti-competitive conduct, misuse of market power and cartel behaviour such as price fixing.

As stated above, an asset manager like Vanguard would have no incentive to limit competition in any industry as this does not benefit us nor our investors. In addition to this lack of incentive, asset managers such as Vanguard are extensively governed and scrutinised under regulatory regimes.

The role of regulators in responding to the common ownership theory

The benefits of any policy solution should be carefully weighed up against the costs of implementing it and any potential detriment to the market, including its consumers. This is especially true for the common ownership theory where the problem is unproven and individual Australian investors may bear the costs or detriment associated with any policy solutions.

The policy proposals floated in Leigh and Triggs (2021), such as reduction in substantial shareholder notification thresholds from 5 per cent to 1 per cent, would not have any meaningful impact to competition but would likely increase compliance costs for asset managers, investors and regulators, as well as potentially making Australia's equity capital markets out of step with other jurisdictions.

ASIC and the ASX play an important role on this issue to ensure efficient market functioning and transparency of relevant information for investment decisions and orderly markets.

Similarly, policies that seek to restrict the proxy voting and stewardship activities of asset managers would diminish the expertise and scale that individual Australian investors gain access to by investing with a professional investment manager who is both incentivised and obligated to act in their best financial interests.

In the absence of conclusive evidence that common ownership affects competition, regulators should take no action that would harm markets or reduce the ability of asset managers to deliver low-cost investment outcomes to Australian investors.

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Policy supporting the benefits of scale

While the Treasurer's letter and terms of reference include the examination of capital concentration in the superannuation sector, Government policy and APRA prudential guidance have been to actively incentivise, encourage and promote superannuation fund mergers with the knowledge that smaller funds generally provide sub-optimal member outcomes. Smaller funds tend to have higher fees and lower returns, unable to provide the benefits of scale to members. In fact, APRA will intervene on unperforming or underperforming smaller funds who do not merge or who do not act on merger proposals from larger funds.

> *"The prudential regulator has labelled superannuation funds with less than $30 billion in assets "uncompetitive", argued that fees in the super sector are still too high, and criticised some fund mergers for creating unsustainable entities with insufficient scale and governance capabilities." Australian Financial Review (2021)*

APRA has extensively acknowledged the benefits of scale in funds to the members. This is consistent with Vanguard's experience that scale enables superior investor/member outcomes and lower costs. Further, per our literature review and academic research conclusions, this scale has not been accompanied by any adverse market or competition impacts.

Conclusion

Vanguard's core purpose is to give investors the best chance of investment success and we do so largely by offering passively managed index funds. Indexing, owing to its consistent relative performance, low costs, and broad diversification, has helped millions of investors achieve their financial goals.

The aggregate company ownership stakes of our funds are a function of the broad diversification inherent with these investment funds.

The academic research purporting to demonstrate negative impacts to consumers as a result of common ownership often fundamentally misunderstand asset managers' fiduciary duty to fund investors, and overstate the influence that managers have over portfolio companies.

The assertion that fund managers and fund investors stand to benefit from anti-competitive outcomes is incorrect. Reduced competition would likely have negative impacts on other companies and industries in which Vanguard funds also invest

Our duty to manage investments in the best interest of fund investors compels us to advocate, engage and vote for good, long term corporate governance practices at all the companies in which our funds invest. Our engagements with companies are not related to strategy, pricing policies or day-to-day operations. Our company engagements are predicated on a fiduciary stance, not an ideological or a control-seeking one.

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Furthermore, asset managers are appropriately regulated to ensure their fiduciary duty to each fund is upheld, as well as being bound by transparency and disclosure obligations.

We believe that further regulating the common ownership of companies within the same industry, based on an unproven hypothesis, could be detrimental to investors and markets alike.

We appreciate the opportunity to make this submission to the Inquiry and look forward to participating in the public hearings later this month.

Yours faithfully.

Robin Bowerman

Head of Corporate Affairs

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Appendix A: Literature review on common ownership

1. The theory of common ownership

The impact of market concentration on price and output levels of companies and entire industries has been extensively studied for decades. The common ownership hypothesis contributes to this work by extending commonly used measures of market concentration to incorporate the ownership structure of companies. Underlying this extension is the assumption that company management not only aims to maximise its own company's profitability but also pays attention to the company's shareholders and those shareholders' interests in competing companies within the same industry. Such shareholders are referred to as "common owners."

According to Azar, Raina, and Schmalz (2019) (the "Banking Paper"), a company may "put weight not only on its own profits but also on the profits of its competitors—to the extent that its most powerful shareholders also hold stakes in those competitors." Azar, Schmalz, and Tecu (2018) (the "Airlines Paper") argue that when shareholders in an airline company also hold stakes in other airlines, management's goals may include refraining from increasing capacity in airline routes, or from engaging in competitive airfare pricing behaviour in markets in which such shareholders hold large ownership interests. By contrast, managers of companies with shareholders whose sizeable interests are limited to one company may not feel pressure to refrain from aggressively pursuing a growth strategy at the expense of rivals.

This reasoning, along with some initial empirical analyses indicating that common ownership of competing companies is positively correlated with prices of goods and services, sparked wider interest from researchers and regulators.

For example, Elhauge (2016) argues that common ownership can help explain fundamental economic puzzles, including why corporate executives are rewarded for industry performance rather than individual corporate performance alone, why corporations have not used recent high profits to expand output and employment, and why economic inequality has risen in recent decades. The paper also argues that common ownership that creates anticompetitive effects is illegal under current antitrust law and recommends antitrust enforcement actions to reduce this type of common owner. Anton, Ederer, Gine and Schmalz (2016) ("the Executive Compensation Paper"), also suggest that increased common ownership has led to executive compensation packages that reward management less for the success of the manager's own firm and more for the success of the industry as a whole.

More recent studies, however, have challenged not only the methodological specifications and empirical results of the initial analyses, but also the assumed underlying causal mechanisms as we will discuss in more detail below.

2. MHHIΔ as a measure of common ownership

The theoretical underpinning of the majority of recent empirical work on the impact of common ownership on prices and output levels of firms goes back to Salop and O'Brien (2000) who extended a measure commonly applied in merger analyses, the Herfindahl-Hirschman Index (HHI), to allow for the assessment of the impact of partial ownership by one competitor of another competitor. Azar, Schmalz, and Tecu (2018)

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(the "Airlines Paper") extended this concept further, introducing the modified Herfindahl-Hirschman Index ("MHHI") and applied it in a different context where institutional investors hold shares in competing firms.

MHHI is a measure that extends the traditional measure of market concentration (HHI) by adding a term which quantifies the degree of common ownership. Algebraically, MHHI is defined as:

MHHI = HHI + MHHIΔ

MHHI delta ("MHHIΔ") hereby represents the contribution of common ownership to MHHI. MHHIΔ is calculated based on: (i) the relative equity stakes of common owners, (ii) the market shares of each firm in the market, and (iii) the effective control that each common owner has over a firm.

There are a number of documented issues with studying the impact of common ownership on prices and output levels of firms using MHHI as 'extended' measure of concentration. We list a few issues that appear most straightforward here

Issues related to MHHIΔ's data inputs:

1. **MHHIΔ can fluctuate even if common ownership remains stagnant and can even move in the opposite direction of common ownership.** O'Brien & Waehrer (2017) point out that "[MHHIΔ] and MHHI may rise or fall with an increase in common ownership." So, a change in MHHIΔ does not necessarily correspond to a change in common ownership, making MHHIΔ an unsuitable proxy for common ownership in many empirical models. As a result, identifying a statistically significant link between MHHIΔ and prices does not translate to an equivalent link between common ownership and prices.

2. Wang et al. (2019) provide a theoretical discussion of MHHIΔ and its implications. The authors highlight four limitations of MHHIΔ in the presence of incomplete ownership data. In this case, MHHIΔ can:
    a. Be insensitive to changes in the absolute percentage share held by common owners
    b. Be sensitive to the characteristics of non-common owners
    c. Be insensitive to changes in the number of common owners
    d. Reach extreme values if the share of known common owners is relatively small

3. Effective control essentially represents the degree to which a firm's manager will consider the preferences of a common owner. In many papers, authors assign control weights based on the assumption of proportional control, meaning that if a shareholder owns 10% of the voting shares of a firm, then the control weight will also be 10%. However, there is no established theory to support the assumption of proportional control, nor is there theoretical or empirical evidence to support the assumption that firm management pays any attention to its owners' equity holdings in rival firms. Nonetheless, the papers **assume proportional control for purposes of calculating MHHIΔ**. This point is especially pertinent in the context of growing institutional fiduciary ownership of equity assets, which cannot by default be equated with control-seeking investment strategies.

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Issues when MHHIΔ is used in a regression context:

1. **Market shares and MHHI are endogenous** - MHHI depends on market shares, which depend on the same underlying factors that drive prices.[8] Because market shares and MHHI are likely to be related to factors that affect price that are not included as explanatory variables in the regression equations, the regression estimates from the specifications employed are likely to yield a relationship between MHHI and price. Under plausible conditions and for reasons not related to common ownership, this relationship may be positive. That is, an estimate of this relationship could erroneously suggest a positive relationship between price and common ownership when none exists.

2. **Co-linearity between MHHIIΔ and HHI:** By definition, MHHIIΔ as well as HHI are impacted by revenue shares. The simultaneous use of these two variables in the same regression specification, as it is done in many studies, can cause co-linearity issues which may bias regression results.

3. **Correlation is not causation.** In some analyses authors find that MHHIΔ and prices are positively correlated. Some authors go a step further and argue that common ownership has caused higher average prices. Even if MHHIΔ were a suitable proxy for common ownership, a positive correlation between MHHIΔ and prices is not evidence that an increase in MHHIΔ causes an increase in prices.

These flaws in the key explanatory variable render the results of many papers on common ownership (e.g., the "Airlines Paper") that base their findings on MHHIΔ inconclusive. While MHHIΔ may be correlated with prices, the question of common ownership's relation to prices remains unclear.

3. Studies that cast doubt on the link between common ownership and consumer outcomes

3.1 | Studies with focus mainly on conceptual aspects

- Ginsburg and Klovers (2018) describe four shortcomings of research linking common ownership to decreased competition.
    - First, proponents conflate asset management and economic ownership and therefore incorrectly attribute allegedly anticompetitive conduct to asset managers.
    - Second, proponents overstate the validity and strength of the existing empirical work purporting to show common ownership causes anticompetitive effects.
    - Third, proponents overstate their legal case by relying on inapplicable cross-ownership cases and stretching the holdings of those cases.

[8] These endogeneity concerns are widely discussed in the academic literature. See, for example, O'Brien, Daniel P. and Keith Waehrer, 2017. The Competitive Effects of Common Ownership: We Know Less Than We Think.

- Fourth, at bottom proponents' concerns are with either conscious parallelism, which is not illegal, or anticompetitive conduct that, if proven, could be addressed using established antitrust doctrines.

- Hemphill and Kahan (2018) examine the causal mechanisms that might link common ownership to anticompetitive effects. The authors conclude that most proposed mechanisms either lack significant empirical support or else are implausible.

- Walker (2019) explores possible association between common ownership and executive pay design, challenging both the theoretical and empirical bases for this argument. The author shows that the use of competition-enhancing executive relative performance evaluation as a compensation tool increased dramatically in parallel with increase in common ownership, exactly the opposite of what one would expect if common owners sought to dampen competition through pay design. Walker (2019) contends that executive pay design is actually an implausible mechanism linking common ownership with reduced competition.

3.2 | Studies with focus on empirical aspects

3.2.1 | Studies that 'correct' data inputs but still use MHHIΔ

- Dennis, Gerardi & Schenone (2017) ("DGS") challenges the results of the Airlines Paper, finding that the results depend heavily on the paper's method of giving more statistical weight to airline routes with higher passenger volume. When all routes are considered equally, this research finds that the Airlines Paper's conclusions disappear, further **highlighting that the Airlines Paper's results only hold under very specific assumptions in the empirical model.**

- DGS also highlight **the over-inclusiveness of the control assumptions** used in the airline paper. The airline paper calculated control based on Securities & Exchange Commission 13F filings, which distinguish shares as having either "sole," "none," or "shared" voting rights. While shares with "sole" voting rights should certainly be counted in full and shares with "none" should be ignored, there is ambiguity as to the practical amount of control held through shares with "shared" voting rights. However, despite this ambiguity, the airline paper treated "shared" rights as equivalent to "sole" rights, while DGS argues that a more reasonable approach would be to include only "sole" rights.

- The control assumptions in the Airlines Paper are also further challenged by the DGS paper. In particular, DGS notes that **several airlines in the study were involved in bankruptcy proceedings**, during which time the fiduciary duties of management shift from shareholders to creditors. However, despite this shift in fiduciary duty, the Airlines Paper continued to assume that shareholders retained the same level of pre-bankruptcy control in bankrupt airlines.

- BlackRock (2019) focuses on index inclusion rules and the use of incorrect data on asset managers' airline holdings in the Airlines Paper. Over the Airlines Paper's study period, five of the seven airlines went through bankruptcy and were excluded from S&P indices, yet in the Paper it was assumed that the asset managers' holdings during bankruptcy were the same as those preceding the bankruptcy. Blackrock illustrates the magnitude of the discrepancy between the actual holdings of American Airlines stock in BlackRock-managed portfolios and the holdings that

were used in the Airlines Paper based on this error in the authors' data compilation. The discrepancy was in the order of millions of shares which reflected an actual ownership under 0.09% versus the authors' assumption of 4.35%. This significant error affected 28 out of 56 quarters in the study period and led to grossly overstated holdings data in the Airlines Paper. Blackrock (2019) found that the statistical significance of the findings of the Airlines Paper is eliminated when the error is accounted for.

- Kwon (2017) found that, contrary to the Executive Compensation Paper, common ownership increases the sensitivity of executive compensation to the profits of their own firm versus rival firms, thus promoting more aggressive competitive behaviour. The main difference between the two papers is that the executive compensation paper studies changes in terms of dollar amounts (e.g. a $1 increase in pay), while Kwon (2017) studies changes in terms of percentages (e.g. a 1% increase in pay). While the specific merits of the executive compensation paper's empirical model versus the Kwon model can be explored further, the main takeaway is that the conclusions regarding common ownership are highly sensitive to the specific model being employed. Likely, given that each study relies on MHHIΔ as a proxy for common ownership, neither represents an accurate estimate of common ownership's impact on executive compensation.

3.2.2 | Studies that use alternative measures of MHHIΔ

- Kennedy et al. (2017) use alternative models testing the effect of common ownership on airline ticket prices, estimating common ownership in a more direct manner that removes the problems caused by the inclusion of market shares in MHHIΔ. In this alternative model of common ownership, **the study finds that common ownership decreases ticket prices, reversing the results of the original Airlines Paper**.
- The Kennedy et al. paper also estimates an additional empirical model to test whether the assumption of proportional control, used in the original Airlines Paper, is sufficient for common ownership to affect prices. **The results suggest that there is no evidence that partial owners with proportional control exert any influence on a corporate manager's pricing decision.** The paper also questions the applicability of the theory of horizontal mergers and cross-ownership theory in the context of common ownership.
- The Kennedy et al. paper demonstrates that the airline and banking studies are not robust as modest and reasonable data modifications lead to different results from the original model, with the link between common ownership and increased prices either disappearing or significantly diminishing.
- Gramlich and Grundl (2017) use an alternative methodology to measure the effect of common ownership by analyzing the weights that firms place on each other's profits rather than using measures of industry concentration (e.g., MHHI). The authors conclude that the results found in the Banking Paper are not robust and that statistical evidence of common ownership impacting competition is mixed.
- Gramlich and Grundl (2018) use accounting data from the banking industry to examine empirically whether common ownership affects profits. The paper finds little evidence for economically important effects of common ownership on profits in the banking industry.

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- Based on a sample of S&P 500 companies, Backus, Conlon, and Sinkinson (2019) focus on the development of common ownership over time. **They document a significant rise in common ownership from 1980 to 2017 but find that increases in levels of common ownership tend to substantially lag the rise in product markups, which calls into question whether there is a causal relationship between common ownership and price increases.**
- Levellen and Lowry (2019) find that the effects that some studies have attributed to common ownership are caused by other factors, such as differential responses of firms (or industries) to the 2008 financial crisis. They proposed a modification to one of the previously used empirical approaches that is less sensitive to these issues. Using this to re-evaluate the link between common ownership and firm outcomes, the authors found **little robust evidence that common ownership affects firm behaviour**.

3.2.3 | Studies with explicit focus on the cross-industry perspective

Some studies recognized that that the recent rise of common ownership is not only a within industry phenomenon, but an economy-wide one, driven to a large extent by funds that are close to "universal owners" and hold every publicly traded firm in an economy. Hence, if common ownership does have measurable effects on consumer outcomes, it should do so irrespective of the industry observed.

- Wang et al. (2019) assess the common ownership hypothesis in the aggregate, using a panel of about 3,000 U.S. firms in about 200 industries over a 21-year period. The authors explore the statistical relationship between common ownership and profitability across multiple model specifications, such as (1) two alternative econometric models, (2) different sets of control variables, (3) different time periods, and (4) four variations of MHHIΔ. Wang et.al (2019) **do not find conclusive evidence that common ownership is associated with industry-level profit margins.**
- Koch, Panayides, and Thomas (2020) find that **common ownership is neither robustly positively related with industry profitability or output prices, nor robustly negatively related with measures of non-price competition**, as would be expected if greater common ownership encouraged product market rivals to compete less aggressively. This conclusion holds regardless of industry classification, common ownership measure, profitability measure, non-price competition proxy, or model specification. Based on this data, the paper concludes that antitrust restrictions seeking to limit common ownership are not currently warranted.
- Recent theoretical work by Azar and Vives (2020) shows that, in a general equilibrium oligopoly model, common ownership covering the whole economy implies lower markups for consumers, not higher. The reason is that, in general equilibrium, when an industry expands, it creates positive externalities for firms in other industries, and therefore inter-industry common ownership increases the incentive for firms to expand, reducing prices in their industry relative to the price level. It turns out that this effect, in a standard model, is stronger than the intra-industry effect that common ownership of firms in the same industry generates. Therefore, the total effect is expected to reduce product-market markups.
- Azar and Vives (2021) **acknowledged that that their prior research (the "Airlines Paper") only focused on intra-industry common ownership and therefore excluded a crucial missing variable, inter-industry common ownership**. Estimating both components, the authors

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reassessed the empirical effect of common ownership on the airline industry. Azar and Vives (2021) showed that inter-industry common ownership has a negative effect on prices.

4. Summary and review of Leigh and Triggs (2021)

In their recent publication - 'Common Ownership of Competing Firms: Evidence from Australia' (2021) - Leigh and Triggs review the global common ownership debate and set out to apply the MHHIΔ measure to the Australian market.

The authors begin their paper by reviewing those recently published papers that document a link between measures of common ownership and consumer outcomes such as output quantities and product prices or companies' profit margins. In the empirical part of their study, the authors then compute two measures of market concentration: the traditional Herfindahl Hirschman Index (HHI) as well as a recently conceived extension the "Modified Herfindahl Hirschman Index delta" (MHHIΔ) described in Section 2 above. The authors hereby focus on companies listed on the Australian Stock Exchange (ASX). Ownership information is sourced from IBIS World.

The authors acknowledge that the dataset used is not of best quality and needed a range of manual corrections. Further, and this is a characteristic of the Australian regulatory system, information available about the ownership structure of Australian companies is less complete than it is for the US – the market used as the basis in the majority of related empirical studies.

The authors find that the consideration of common ownership in addition to HHI increases the 'effective' market concentration in Australia by approximately 21% across the entire Australian economy.

A close review of Leigh and Triggs (2021) yielded a number of shortcomings from our perspective which we list below:

- The literature review conducted by Leigh and Triggs (2021) appears quite one-sided. It cites exclusively those studies that (claim) to have found a link between 'common ownership' and consumer outcomes. It fails to acknowledge any of those studies published over the last years that cast doubt on the existence and/or validity of such links.
    - Notable omissions include Azar and Vives (2020) and Azar and Vives (2021). In these papers the authors acknowledged that that their prior research (e.g. the "Airlines Paper") only focused on intra-industry common ownership and therefore excluded a crucial missing variable, inter-industry common ownership. Azar and Vives (2020) showed that, theoretically, in a general equilibrium oligopoly model, common ownership covering the whole economy implies lower markups for consumers, not higher. Azar and Vives (2021) empirically estimated both intra-industry common ownership and inter-industry common ownership in the airline industry and demonstrate that inter-industry common ownership has a negative effect on prices.
- When referring to related studies, the authors frequently refer to 'common ownership' in general rather than to 'a measure of common ownership'. This causes the reader to assume that the cited authors used 'correct' causal measures of common ownership (see, e.g., 'Azar, Raina and Schmalz (2019) found that common ownership of banks in a country led to higher fees and lower

deposit rates' (p. 1)). At best, Azar et al. (2019) found that their measure of common ownership (MHHIΔ) was positively linked to higher fees and lower deposit rates. Also, as many studies point out, MHHIΔ may be far from being an adequate measure of common ownership, especially in the absence of complete information of companies' ownership structures.

- Wang et al. (2019) – the Vanguard Paper at Appendix B - show that MHHIΔ reacts very sensitively to changes in its inputs. In some instances, MHHIΔ can even produce counter-intuitive results.
    - For example, one of the main determinants of its validity as a measure of common ownership is linked to the knowledge about companies' ownership structures. In the absence of complete information, MHHIΔ fills the data gap with small and dispersed owners. The more the reality deviates from this implicit assumption, the less acceptable MHHIΔ becomes as measure of common ownership.
    - Unfortunately, the authors do not provide much information about the share of companies' ownership structure that they can explain using the Morningstar dataset. Using US data sourced from 13-F filings, Wang et al. (2019) were able to explain between 50% and 75% of the ownership of Russell 3000 companies' shares outstanding. The resulting computation of MHHIΔ turned out to be highly sensitive to assumptions made with regard to the non-explained portion.

Given that investors under Australian law are required to report holdings only if they exceed 5% of shares outstanding, it is reasonable to assume that the portion explained in Leigh and Triggs (2021) is even lower – hence, MHHIΔ may be even more sensitive to variations in assumption made about the nature of such unknown owners. Therefore, any empirical results linked to MHHIΔ (including its magnitude) need to be treated with great caution.

5. Selected further categories of common ownership related work

5.1 | Studies that explore the link between common ownership and investment

- Gutierrez and Philippon (2016) find that industries with more concentration and more common ownership and potentially, increased short-termist pressures, invest less, even after controlling for current market conditions. Within each industry-year, the authors find the investment gap to be driven by firms that are owned by quasi-indexers and located in industries with more concentration and more common ownership, according to the authors' analyses. The authors acknowledge that these conclusions are based on simple regressions and therefore cannot establish causality between competition, governance and investment.

5.2 | Studies that explore the link between common ownership and innovation

- Kini et al. (2018) find that overlapping institutional ownership in the same industry can have anti-competitive effects but can also elevate product market competition by promoting investments with industry spillover effects. Using a cross section of U.S. public firms, the authors find that firms with higher common ownership face greater competitive threats from their rivals. The authors find the pro-competitive (anti-competitive) effect of common ownership is stronger (weaker) in less concentrated industries and industries with similar products/technologies. As a result, the authors suggest a more nuanced approach to any proposed regulation of common institutional ownership.

- Anton et al. (2021) who also study the link between common ownership and innovation find that common ownership increases innovation when technological spillovers are sufficiently large relative to product market spillovers. Otherwise, the business stealing effect of innovation dominates and common ownership reduces innovation.
- In a similar vein, Vives (2020) explores whether common ownership can help firms to internalize technological spillovers and countervail the reduced incentives they may have to compete. The author finds that common ownership may be welfare-improving in particular when spillovers are high and R&D investment has commitment value since in this case firms have strong incentives to underinvest. According to the author, inspection of common ownership by antitrust authorities is most warranted for industries with high concentration, since increased concentration (i.e., HHI) expands the region of spillover values for which common owners are welfare-decreasing, thus, making it more likely that common owners will be so.
- Borochin et al. (2020) identify two countervailing effects of common ownership on corporate innovation. Higher common ownership by focused, long-term dedicated institutional investors promotes innovation output and impact, as measured by number of patents and non-self citations. Meanwhile, higher common ownership by diversified, short-term transient investors discourage these. Moreover, the effects of common ownership by diversified, long-term quasi-indexing institutions on innovation vary with industry competitiveness. According to the authors, common ownership affects innovation through the channels of firm valuation and financing constraint.

6. Meta-studies on common ownership

Numerous meta-studies have been undertaken to review the academic debate on the common theory. The papers listed below leverage independent thought leadership across the U.S., EU and Australia and are authored by Committee on Capital Markets Regulation, U.S.-based independent research organization, Alec J. Burnside & Adam Kidane, EU-based antitrust/competition lawyers with Dechert LLP, and Professor Jennifer G. Hill, Chair in Corporate and Commercial Law at Monash University, Australia.

- Committee on Capital Markets Regulation, Common Ownership and Antitrust Concerns, (2017) reviews the literature supporting the common ownership hypothesis and finds that the hypothesis is unproven. The paper explains that the original common ownership research is based on questionable methodologies and that the findings do not stand up to critiques of other academics whose subsequent research collectively finds that anticompetitive effects of common ownership cannot be found in the data and, therefore, states the original research findings are largely inconclusive. The paper further argues that no solution is necessary to a problem that is not proven to exist.
- Burnside and Kidane (2020) examine common ownership through a European lens and survey the available evidence on levels of common ownership in Europe. The paper also reviews the academic debate, both methodological and theoretical, around the common ownership theory to consider if it is sufficiently robust to provide a basis for enforcement and, if so, whether current European Union competition law tools could be used to that end. The authors conclude that it is premature to draw any conclusions as to the reality of alleged common ownership concerns or to base enforcement efforts on them. Until a better understanding of the underlying facts and a broad

academic consensus emerge, reform prescriptions that have been advanced are a solution in search of a problem – to say nothing of the conflicts that would arise with other rules governing asset management.

- Hill (2020) examines three conflicting narratives that emerge in the literature concerning institutional investors and common ownership theory. The paper seeks to position these narratives within the context of the rising influence of institutional investors since the early 1990s and its relation to major international corporate governance developments. It analyses aspects of common ownership theory in light of these contemporary corporate governance developments and argues that drawing regulatory and policy conclusions from the current body of conflicting empirical findings on the effects of common ownership is premature.

7. Studies with focus on policy implications in the context of common ownership

- Based on research findings of the Airlines Paper, the Banking Paper and the Executive Compensation Paper, some economists and lawyers have called for more vigorous antitrust enforcement against minority shareholdings of institutional investors. Posner, Scott Morton and Weyl (2017) called for limits to be placed on common ownership so no institutional investor invested in more than a single "effective firm" in an oligopoly may own more than 1% of the industry or communicate with its managers. The authors believe that this would induce most significant institutions to hold only a single 'effective firm' and would restore oligopolistic markets to competitive conditions.
- Buckberg et al. (2017) question the validity of the common ownership hypothesis and argue that the proposed legal remedies are both premature and flawed given the harm that they would do to investors and to the real economy.
- Lambert and Sykuta (2018) argue that the theory that common ownership reduces competition or has harmful anticompetitive effects seems implausible. The authors point out that broadly diversified investors are not only intra-industry, but also inter-industry diversified. According to Hemphill and Kahan (2018), inter-industry diversified investors such as large investment managers are likely to also hold shares in suppliers and customers of the competing companies. If a given industry increases prices or reduces output levels as a result of common ownership, it would most likely have an adverse effect on suppliers and customers. Therefore, these managers would bear the costs of anticompetitive conduct to some extent. This and related observations lead Lambert and Sykuta (2018) to support "the case for doing nothing about institutional investors' common ownership of small stakes in competing firms." Moreover, the authors maintain that proposed interventions reduce overall social welfare.
- Patel (2018) argues that policy proposals to limit common ownership would generate substantial competitive harm and argues that common ownership should continue to be evaluated on a case-by-case basis.
- Novick et al. (2017) provides an industry perspective on common ownership and argues that placing limits on the ability of asset managers to make investments will essentially put the onus

back on asset owners (such as superannuation/pension funds) to create their own diversified portfolios.

- Rock and Rubinfield (2017) investigate common ownership from an antitrust perspective. The authors acknowledge that common ownership in concentrated markets can theoretically have anti-competitive effects. However, exploring questions such as (1) whether there is substantial evidence that common ownership by diversified institutional investors currently has anti-competitive effects, (2) whether existing holdings by diversified institutional investors in concentrated markets violate the U.S. federal antitrust laws (in particular, Section 1 of the Sherman Act or Section 7 of the Clayton Act), and (3) whether such investors should be forced to hold only one firm in any concentrated industry, the authors found attack on widely diversified institutional investor ownership lacking.

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Appendix B:

Common ownership and industry profitability: A cross-industry view

Haifeng Wang, Jan-Carl Plagge, James J. Rowley Jr., and Roger A. Aliaga-Díaz, 2019

Full research paper included in the following pages.

Common ownership and industry profitability: A cross-industry view

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Common ownership and industry profitability: A cross-industry view *

Haifeng Wang, Jan-Carl Plagge, James J. Rowley Jr., and Roger A. Aliaga-Díaz†

Abstract

Our paper contributes to the common ownership debate by empirically assessing the link between common ownership and profitability as a proxy for market competition. Rather than focusing on single industries, as most related studies do, we assess the common ownership hypothesis in the aggregate, using a panel of about 3,000 U.S. firms in about 200 industries over a 21-year period. We hypothesize that if anticompetitive effects due to common ownership were present within individual industries, then the same anticompetitive outcomes should be observed when the data is expanded to cover all industries and over an extended period of time. We explore the statistical relationship between our chosen measure of common ownership and profitability across multiple model specifications, such as (1) two alternative econometric models, (2) different sets of control variables, (3) different time periods, and (4) four variations of MHHIΔ. We do not find conclusive evidence that common ownership is associated with industry-level profit margins.

Keywords: Common ownership, MHHI, competition, industry profitability

JEL-Classification: L10, L21, L41

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1 Introduction

The impact of market concentration on price and output levels of companies and entire industries has been extensively studied for decades. A more recent stream of literature contributes to this work by extending commonly used measures of market concentration, such as the Herfindahl-Hirschman Index (HHI), to incorporate the ownership structure of companies. The extension, commonly termed MHHIΔ, measures concentration due to investors that own shares across various (competing) companies within an industry. These shareholders are termed "common owners."[1] Underlying this extension is the assumption that company management not only aims to maximize its own company's profitability but also pays attention to the company's shareholders and those shareholders' interests in competing companies within the same industry.

According to Azar, Raina, and Schmalz (2016), a company may "put weight not only on its own profits but also on the profits of its competitors—to the extent that its most powerful shareholders also have stakes in those competitors" (p. 13). For example, one may conclude that when shareholders in an airline company also hold stakes in other airlines, management's goals may include refraining from increasing capacity in airline routes or from engaging in competitive airfare pricing behavior in markets in which such shareholders hold large ownership interests. By contrast, managers of companies with shareholders whose sizable interests are limited to one company may not feel pressure to refrain from aggressively pursuing a growth strategy at the expense of rivals.

This reasoning, along with some initial empirical analyses indicating that common ownership of competing companies is positively correlated with prices of goods and services, sparked wider interest from researchers and regulators alike.

[1]Total concentration, represented as modified Herfindahl-Hirschman Index (MHHI), is then expressed as MHHI = HHI + MHHIΔ.

More recent studies, however, have challenged not only the methodological specifications and empirical results of the initial analyses but also the assumed underlying causal mechanisms.

Our paper contributes to this topical debate by empirically assessing the link between common ownership and profitability. If common ownership dampens market competition, profitability of the overall industry would be higher, all else equal, although it may potentially damage the interests of one or more of the industry participants. As pointed out by Koch, Panayides, and Thomas (2019), the industry coordination hypothesis "predicts increases (decreases) in profitability following increases (decreases) in common ownership perhaps from an increase in coordination (the collapse of prior coordination. p.3)."

Rather than focusing on single industries, as related studies do, we broaden the scope by analyzing the relationship between common ownership and profitability across multiple industries. Our data set includes about 3,000 U.S.-domiciled companies across about 200 industries from 1996 to 2016.

Further, we explore the characteristics of MHHIΔ, a measure of common ownership used in our study as well as by others who have contributed to the common ownership academic debate. However, rather than subjecting our empirical analysis to implicit assumptions inherent in this measure, we make its implications explicit and use various ways to control for them. We find that MHHIΔ is limited in its reliability, especially in light of incomplete information. Accordingly, we test the robustness of our results using alternative specifications of input parameters.

Our preferred econometric specification is a dynamic panel data model estimated through a generalized method of moments (GMM) instrumental variables (IV) estimator (see Arellano and Bond, 1991; Arellano and Bover, 1995; and Roodman, 2009a). Estimation results based on this model confirm the presence of important first-order dynamic effects in an industry profitability variable that otherwise could not be adequately treated with more common estimation techniques, such as fixed-effect panel data methods. Additionally, the IV estimator allows us to address potential endogeneity concerns in our coefficient of interest. In fact, although the initial use of a static (industry and year) fixed-effects model indicates a

positive relationship between MHHIΔ and industry-level profit margins in a few selected specifications, the application of a dynamic GMM model to address autocorrelation and endogeneity either substantially reduces the significance of MHHIΔ or renders the relationship insignificant in the majority of our models.

We do not find conclusive evidence that common ownership is associated with industry-level profit margins. Rather, our findings indicate that the relationship between our chosen measure of common ownership (MHHIΔ) and profitability is very sensitive to and inconsistent across changes in (1) the choice of the statistical regression model, (2) the control variables used, (3) the time periods observed, and (4) the specification of the measure used to quantify common ownership. We test the statistical relationship predicted by the common ownership hypothesis in light of many possible variations of these modeling specifications.

The rest of the paper is structured as follows: Section 2 provides an overview of the relevant literature. Section 3 develops our hypothesis and discusses the construction and implications of MHHIΔ. Section 4 describes our sample and the data used in our estimation strategy. Section 5 specifies the empirical model. Section 6 presents the results. Section 7 concludes.

2 Literature overview

The theoretical underpinning of the majority of recent empirical work on the impact of common ownership on prices and output levels of firms goes back to Salop and O'Brien (2000). The authors extend a measure commonly applied in merger analyses, the HHI, to allow for the assessment of the impact of partial ownership by one competitor of another competitor. Azar, Schmalz, and Tecu (2018) have further extended this concept beyond what Salop and O'Brien (2000) considered and applied it in a different context where institutional investors hold shares in competing firms.

In recent years, some empirical analyses used MHHIΔ as the variable to explain product prices and/or company output levels. The assumption behind its use lies in the incentive structure of managers. It is assumed that managers do not merely aim to maximize the profits of the company they manage but also aim to maximize the weighted cash flow rights of its shareholders, thereby explicitly considering shareholders' holdings in the company's competitors.

In support of this reasoning, Anton et al. (2017) suggest that executive compensation is based less on their own company's performance than on the profitability of the company's competitors if the companies in the industry are more commonly owned by the same set of investors.

Applying both HHI and MHHIΔ as variables in explaining ticket prices in the U.S. airline industry, Azar, Schmalz, and Tecu (2018) find a positive and significant relationship between both HHI and MHHIΔ and ticket prices. A related study focusing on the banking industry (Azar, Raina, and Schmalz, 2016) find a positive relationship between a generalized measure combining HHI, common and cross-ownership and deposit account interest rates, maintenance fees, and fee thresholds of banks. HHI on a standalone basis, however, was found to be insignificant in explaining these variables.

Recent research, however, calls the initial findings into question. Focusing on the U.S. banking industry, Gramlich and Grundl (2017) assess the relationship between common ownership and deposit rates. In contrast to the measures applied by Azar, Raina, and Schmalz (2016) and Azar, Schmalz, and Tecu (2018), Gramlich and Grundl (2017) assess common ownership on the company level rather than the industry level, using an alternative specification of common ownership to overcome endogeneity issues that may arise with traditional measures of common ownership. Their empirical findings are generally very mixed and sensitive to changes in the settings of the empirical framework.

Similar to Azar, Schmalz, and Tecu (2018), Kennedy et al. (2017) also test the relationship between common ownership and airfare ticket prices. While able to replicate the results of Azar, Schmalz, and Tecu (2018), the authors' change to the econometric model, using instruments that are correlated with common

ownership but not with supply and demand, indicates either no relationship or a negative relationship between prices and the authors' common ownership measures.

Dennis, Gerardi, and Schenone (2018) conduct a third study that focuses on the airline industry. Similar to Kennedy et al. (2017), they are able to closely match the results of Azar, Schmalz, and Tecu (2018). However, these results are also very sensitive to model specifications. For instance, the impact of MHHIΔ on airline ticket prices is reduced in magnitude and rendered statistically insignificant when setting control and cash flow rights of shareholders to zero when airlines operate in the context of Chapter 11 bankruptcy.[2] The impact of these and other model variations leads the authors to reject the assumption that common ownership increases airline ticket prices.

Extending the scope of the analyses beyond specific industries and modeling competitive threats, Kini, Lee, and Shen (2018) find that companies with higher levels of common ownership face greater competitive threats from their rivals because of the higher level of investments.[3] They find that the pro-competitive effect of common ownership is stronger in less concentrated industries and industries with similar products or technologies. These results lead the authors to call for a generally more nuanced approach to analyzing the common ownership hypothesis.

Koch, Panayides, and Thomas (2019) apply MHHIΔ to evaluate the relationship between common ownership on a company level within industries and product market competition. The authors do not find common ownership to be robustly positively related to industry profitability, as would be expected if common ownership reduces competition. This conclusion holds regardless of industry grouping, common ownership measure, portability measure, or model specification.

[2] In their base-case model, Azar, Schmalz, and Tecu (2018) assumed that control and cash flow rights remained constant and identical to their value just before an airline started operating in the context of Chapter 11 bankruptcy. However, this assumption is argued to be indefensible, as shareholders effectively lose both rights under Chapter 11.
[3] The authors model competitive threats based on a text-based variable that captures the extent to which a company's competitors change their product description in their annual reports relative to the company's own description.

Based on a sample of S&P 500 companies, Backus, Conlon, and Sinkinson (2019) focus on the development of common ownership over time. They document a significant rise in common ownership from 1980 to 2017 but find that increases in levels of common ownership tend to substantially lag the rise in product markups, which calls into question whether there is a causal relationship between common ownership and price increases into question.

Focusing on the use of MHHI in the regression specifications of the majority of empirical analyses, O'Brien and Waehrer (2017) highlight endogeneity problems. The authors conclude that "factors other than common ownership affect both price and the MHHI, so the relationship between price and the MHHI need not reflect the relationship between price and common ownership. Thus, regressions of price on the MHHI are likely to show a relationship even if common ownership has no actual causal effect on price" (p. 1).

Rather than focusing on empirical analyses, Hemphill and Kahan (2018) examine the causal mechanisms that might link common ownership to anticompetitive effects. The authors conclude that most proposed mechanisms either lack significant empirical support or else are implausible.

Along similar lines, Lambert and Sykuta (2018) argue that the theory that common ownership reduces competition or has harmful anticompetitive effects seems implausible. The authors point out that broadly diversified investors are not only *intra*-industry but also *inter*-industry diversified. According to Hemphill and Kahan, inter-industry diversified investors such as large investment advisors are likely to also hold shares in suppliers and customers of the competing companies. If a given industry increases prices or reduces output levels as a result of common ownership, it would most likely have an adverse effect on suppliers and customers. Therefore, these advisors would bear the costs of anticompetitive conduct to some extent. This and related observations lead Lambert and Sykuta to support "the case for doing nothing about institutional investors' common ownership of small stakes in competing firms." Moreover, the authors maintain that proposed interventions reduce overall social welfare.

In summary, the current literature examining the potential link between common ownership and anticompetitive effects provides mixed results. Although earlier studies suggest that there is such a link, more recent studies reach contradicting conclusions, in certain cases by focusing on the same sample while varying the methodological framework.

3 Hypothesis development, estimation strategy, and discussion of common ownership measure

Our empirical analysis is designed to assess the impact of common ownership on industry-level profitability. We hereby refer to the theory that common ownership incentivizes and facilitates coordination among rival firms to reduce competition, as the industry coordination hypothesis predicts. Our analysis contributes to the literature by using a cross-industry approach, a dynamic panel model specification, and alternative specifications of MHHIΔ as a measure of common ownership.

3.1 Cross-industry approach

Reduced competition should manifest itself in an increase in prices or an artificial decrease in output, which, in turn, should have a beneficial impact on profit margins, our proxy for market competition. We hypothesize that if anticompetitive effects due to common ownership were present within individual industries, then we would expect to see the same anticompetitive outcomes in the variation of the data across all industries and over time. More specifically, we would expect to see a positive causal link between our measure of common ownership (MHHIΔ) and industry-level profit margins.

Our study tests this relationship based on about 3,000 U.S.-domiciled firms representing about 200 industries across 21 years.

3.2 Dynamic panel model specification

One econometric challenge stems from the fact that industry profitability tends to be highly persistent, so first-order dynamic effects in profit margins when used as a dependent variable are very likely.

Another challenge is that the attempt to explain prices with concentration measures such as HHI or MHHIΔ can lead to endogeneity issues, as these variables may be determined simultaneously, i.e., prices impact revenues, which, in turn, are used in the calculation of HHI and MHHIΔ. This concern likely also holds true for profit margins as used in our study: Company-level revenue is used in the calculation of profit margins (LHS-variable) as well as of HHI and MHHIΔ (RHS-variables).

In order to adequately address the potential impact of our data, we specify a dynamic panel data model and estimate this model with a GMM IV technique.

3.3 Alternative specifications of MHHIΔ as a measure of common ownership

Quantifying common ownership is a major component in our study. While the existing literature discusses a variety of measures, the measure most frequently used is MHHIΔ.[4] MHHIΔ assesses the extent as well as the similarity of investors' holdings across a given set of companies. As this measure will be an integral part of our empirical analysis, this section discusses its construction and characteristics in more detail. The main focus hereby lies on making its implications, especially in the context of imperfect information about company shareholder structures, explicit.

3.3.1 Overview of MHHIΔ as a measure of common ownership

MHHIΔ can be considered a "by-product" of finding the optimal output level of companies under Cournot competition. However, and contrary to what traditional theory states, it is assumed that the management of company (j) does not only aim at maximizing its own company's profits but rather aims at maximizing a weighted average of the interests of the company's shareholders across each shareholder's portfolio of holdings.

[4] For a selection of common ownership measures, see Hansen and Lott (1996), Azar (2011), Gramlich and Grundl (2017), and Lewellen and Lowrey (2018).

As discussed in Salop and O'Brien (2000), who focus on cross-ownership by one competitor of another competitor and not on common ownership by asset managers, the immediate result of this optimization is a term often referred to as MHHI, which can be further broken down into the widely used measure for industry concentration, HHI, and a remainder, MHHIΔ:

$$MHHI = HHI + MHHI\Delta = \left[\sum_j s_j^2\right] + \left[\sum_j \sum_{k \neq j} \left(\frac{\sum_i \gamma_{ij}\beta_{ik}}{\sum_i \gamma_{ij}\beta_{ij}}\right) s_k s_j\right] \quad (1)$$

With

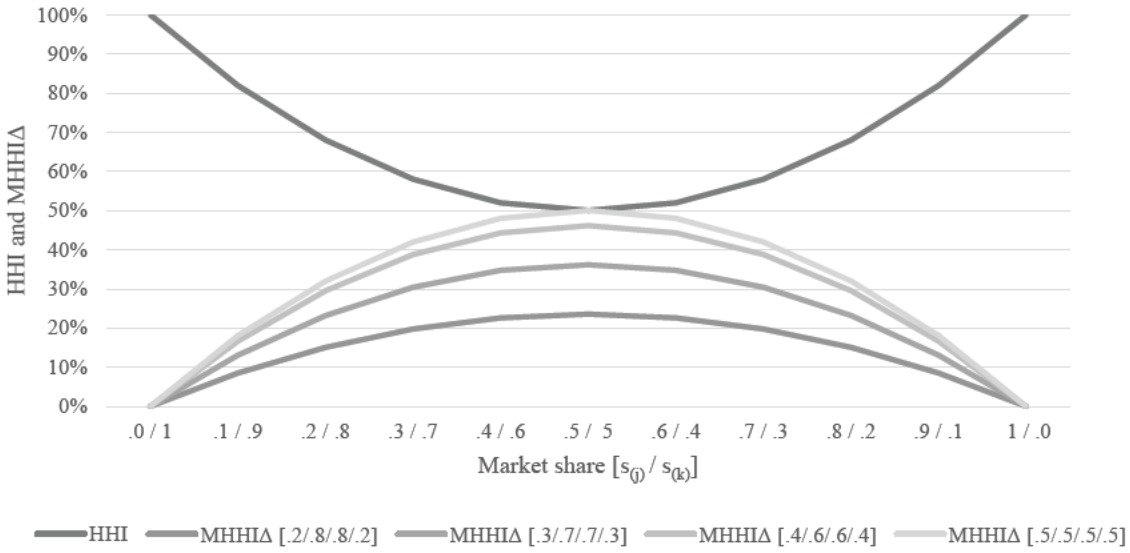
s market share of firm j or k (the share of revenue of company j or k within an industry)
β_{ij} ownership share of firm j accruing to shareholder i
γ_{ij} control share of firm j exercised by shareholder i
k firm j's competitor

Where there is no common ownership, MHHIΔ is equal to zero, with the equation defaulting to the traditional model where MHHI is equivalent to HHI. Following existing literature, we assume proportional ownership, meaning the ownership of a company by a shareholder is equal to the control share of the shareholder.

3.3.2 Implications of MHHIΔ

The decomposition of MHHI allows us to expatiate a first and important implication: HHI and MHHIΔ can be regarded as "complementary" measures. This characteristic is driven by market share (s_j) being a determinant of both measures. To further explain, we demonstrate this effect graphically.

Figure 1: HHI and MHHIΔ as function of market share



HHI and MHHIΔ as function of market share in a two-company/two-shareholder scenario. Market share is based on the revenue allocation (s) of two companies, j and k (s_j / s_k). MHHIΔ is plotted for four examples of ownership distributions of two shareholders, i=1 and i= 2, who own shares in companies j and k. The distribution of ownership is provided in the following structure: (γ_{1j} / γ_{1k} / γ_{2j} / γ_{2k}).

Figure 1 represents HHI and MHHIΔ in a two-company/two-shareholder context as a function of varying degrees of market share (s_j) and ownership distributions. Our example assumes that the two companies explain the relevant market in its entirety and are fully owned by two shareholders.

In this scenario, MHHIΔ reaches its maximum when (a) both companies share the market in equal proportion and (b) the distribution of ownership is equal (i.e., each shareholder, termed common owner 1 (CO1) and common owner 2 (CO2), owns 50% of each company). Consequently, MHHIΔ decreases when the shareholder distribution of ownership becomes more uneven. This makes intuitive sense, as one may expect that the incentives of shareholders start to diverge as a result. However, MHHIΔ also decreases when the market share becomes more unevenly distributed, even when the distribution of ownership is held constant. One way to think about this is that profits of the smaller company become less important in an industry context. However, the dependency of MHHIΔ on the distribution of market shares of companies belonging to the same industry is also the cause of critiques expressed in the extant literature, as s_j simultaneously affects HHI.

By definition, HHI is sensitive only to changes in market concentration. When our hypothetical market share becomes more uneven (i.e., when either company has more of the market relative to the other), HHI rises while, as seen in Figure 1, MHHIΔ decreases. This characteristic may lead to multicollinearity issues when using both HHI and MHHIΔ as explanatory variables in regression analyses.

In addition to multicollinearity issues, there are important implications of MHHIΔ relating to the degree to which the shareholder structure of companies is known.

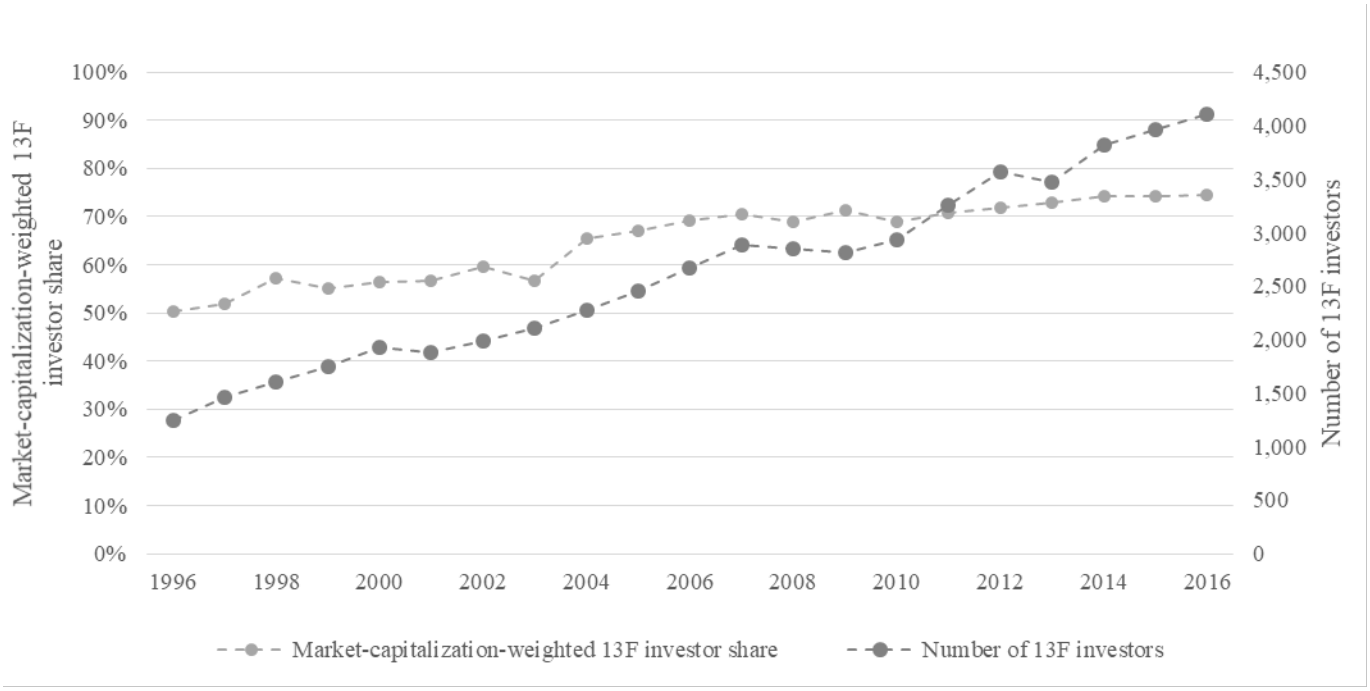
Most of the empirical analyses, including our own, are based on information about the shareholder structure of companies as explained by Securities and Exchange Commission Form 13F filings.[5] These filings, however, capture only institutional investment managers that have investment discretion over $100 million USD. For the purposes of our research, 13F investors can be subdivided into two groups: known common owners and known noncommon owners. Any analysis based only on Form 13F filings implicitly assumes that the unexplained portion is held by small dispersed investors. Hemphill and Kahan (2018) point out that this assumption is incorrect, noting that a survey among U.S. companies showed that more than 50% of companies have an individual and more than 10% have a corporation as their largest shareholder. These owners are less likely to be captured by Form 13F filings. Non-13F filers include unknown noncommon owners and unknown common owners. In order to test the extent to which the structure of noncommon owners impacts our empirical results, we define and model the unknown noncommon owners as both small dispersed and large owners accounting for the entirety of shares in a company that cannot be captured by Form 13F filings.

In fact, and as shown graphically in Figure 2, the shareholder structure of our own sample, consisting of companies among the Russell 3000 Index, is not fully explained by 13F investors.[6] The capitalization-

[5] Some studies accompanied Form 13F filings with Form 13G filings and other hand-collected information. The effort is helpful but does not fully address the issue of missing data.
[6] Further information about the Russell 3000 Index is available at https://www.ftserussell.com/index-series/index-spotlights/us-equity-indexes.

weighted explained portion by 13F investors is about 50% in 1996 and increases to about 75% in 2016. As a result, MHHIΔ implicitly assumes that between 25% and 50% of investors are small dispersed investors.[7]

Figure 2: Share held by and number of 13F investors over time



Growth of number of 13F investors and market-cap-weighted aggregate of 13F investors holding shares in our sample companies from 1996 to 2016.

The implicit assumptions made by MHHIΔ with regard to these remaining shareholders lead to a range of implications. We discuss in more detail:

(1) MHHIΔ can reach extreme values due to a small share of known common owners.

If we refer back to our initial two-company/two-shareholder example in Figure 1 but assume that the two shareholders, CO1 and CO2, do not account for the entirety of each company's shareholder structure

[7] The figure also shows that the increasing share held by 13F investors has been accompanied by an increase in the number of institutional investment managers. Over the course of our sample period, the number of 13F investors rose from approximately 1,200 (1996) to about 4,100 (2016).

but rather hold only 1% each in company j while holding 50% each in company k (with the remainder of company j's shares owned by dispersed shareholders),[8] the value of MHHIΔ increases significantly, compared with our base case. The explanation follows directly from equation (1) $\frac{\sum_i \gamma_{ij}\beta_{ik}}{\sum_i \gamma_{ij}\beta_{ij}}$: When known common owners account for only a small share in company j but hold a comparably large share in company k, the denominator of the ratio is substantially deflated relative to the numerator. From a mathematical perspective, non-13F investors essentially disappear. In fact, if we artificially inflate the number of these shareholders, we may derive scenarios with no upper bound to MHHIΔ.[9]

A strong relationship between common ownership and non-13F investors has also been noticed by Backus, Conlon, and Sinkinson (2019). The authors observe that "a large retail [ownership] share tends to inflate common ownership incentives by giving outsized control rights to a small set of large, diversified institutional investors" (p. 35).

Aggravating the issue, some related studies exclude 13F investors holding less than 0.5% of a company, leaving out about 85% of the observations.[10] This artificially increases the share of non-13 investors and, in certain scenarios, may foster extreme values of MHHIΔ.

(2) MHHIΔ can be insensitive to changes in the absolute percentage share held by common owners.

Under the assumption that the unexplained share of each company's shareholder structure is held by small dispersed investors, it follows from equation (1) that MHHIΔ is not affected by the *absolute* extent of common ownership as long as the proportion of holdings among common owners and across companies remains unchanged. Again, referring back to our two-company/two-shareholder example, we find that

[8] For the theoretical examples discussed in this section, we set the distribution of market shares as represented by the x-axis in Figure 1 to a split of 50% to 50% (i.e., companies j and k account for 50% each of the respective market).
[9] In this example where CO1 and CO2 hold only 1% each in company j while holding 50% each in company k, the MHHIΔ is 1,2505. If CO1 and CO2 hold only 0.1% each in company j, the MHHIΔ becomes 125,000.
[10] Selected studies (see Koch, Panayides, and Thomas, 2019, and Gutiérrez and Philippon, 2016) attempted to fill the gap by rescaling the ownership explained by 13F filings to 100%. This will reduce outliers, but it also changes the distribution of ownership across firms in one industry.

MHHIΔ has the same value irrespective of whether shareholders CO1 and CO2 hold 10% each in both companies or whether they hold 50% each in both companies.

(3) MHHIΔ can be sensitive to the characteristics of noncommon owners.

A third important implication of MHHIΔ is its dependency on the characteristics of noncommon owners. The statement made under (2) holds true as long as the remaining shareholders of company j are unknown noncommon owners. This outcome changes immediately if unknown noncommon owners become known and their holdings enter the calculation of MHHIΔ.

Compare two scenarios: one with two common owners, CO1 and CO2, holding 10% each in companies j and k with the remainder in each company owned by unknown owners, and a second scenario in which two noncommon owners, NCO1 and NCO2, additionally acquire a share of, say, 20% (one in company j and one in company k). Compared with the first scenario, MHHIΔ decreases *ceteris paribus* in scenario two. One might think about this in the context of the theorized effect on company management when noncommon owners have sizable holdings in companies and the managers' propensity to refocus on the maximization of their own company's profits. As put by Hemphill and Kahan (2018), MHHIΔ can be interpreted as a measure of "the degree to which a firm's profit maximization decision is *distorted* by concentrated owners with conflicts of interest" (p. 13).

(4) MHHIΔ can be insensitive to changes in the *number* of common owners.

Again, under the assumption that the unexplained share of each company's shareholder structure is held by small dispersed investors, MHHIΔ does not distinguish between the number of common owners as long as the proportion of holdings among common owners and across companies remains unchanged. In fact, under these conditions, MHHIΔ would take the same value if we replaced any number of known common owners with any multiple or fraction of common owners. One way of explaining this observation is that the incentive structure of each shareholder is determined by the distribution of cash flow streams: If these cash flow streams are identical across shareholders, their interests should be perfectly aligned.

However, it should be noted that this assumption does not hold for noncommon owners. If we replaced the two noncommon owners from above (holding 20% each in companies j and k) with four noncommon owners with each holding 10% in each company, MHHIΔ would increase *ceteris paribus*. Hence, the "distortion by owners with conflict of interest" claimed by some common ownership literature is assumed to become larger when noncommon owners become more numerous.

In light of these characteristics, it is important to treat the interpretation of the empirical results with caution. In addition to possible multicollinearity issues, a closer inspection of MHHIΔ reveals that changes in MHHIΔ are driven not only by changes in the structure of common owners. On one hand, we have identified cases where the shares held by common owners increase or decrease without MHHIΔ being impacted. On the other hand, we have identified cases where MHHIΔ changes while the share held by common owners remains unchanged. Hence, it is the entirety of the shareholder structure of a given industry—defined by 13F investors (known common owners and known noncommon owners) and non-13F investor (unknown noncommon owners, and unknown "dispersed" common owners)—that determines MHHIΔ.

In light of these limitations of MHHIΔ, we compute three alternative specifications of MHHIΔ by varying its input parameters. We do this to test the sensitivity of our empirical results to changes in implicit assumptions introduced as a result of these input parameters.

4 Data sources and variable specification

In order to empirically test the relationship between common ownership and industry profitability, we construct a sample based on companies in the Russell 3000 Index, which represents among the largest 3,000

U.S. firms and roughly 98% of U.S. stock market capitalization. Our data range from 1996 to 2016 and extend to, on average, 194 4-digit North America Industry Classification System (NAICS) industries.[11,12]

In the construction of our empirical model, we collect data from five sources: Thomson Reuters Spectrum, Wharton Research Data Service (WRDS), Compustat, FactSet, and the Bureau of Economic Analysis (BEA). We link 13F ownership filings from Thomson Reuters Spectrum and WRDS with company-level data from Compustat and FactSet in order to create a shareholder ownership profile for each publicly traded company each year. We then map each company into the 4-digit NAICS codes, calculate MHHIΔ and other industry-level control variables, and link with BEA data from each year from 1996 to 2016.

This section provides details of the construction of the dependent variable profit margin (PM) as well as all explanatory variables used in our regression analysis.

Profit margin (PM): To construct our dependent variable profit margin (PM), we source company-level profit and revenue data from Compustat with yearly frequency. As our regression model is specified on an industry level, company-level profit margins are then aggregated per 4-digit NAICS industry on a revenue-weighted basis.[13,14]

$$PM_{qt} = \frac{\sum_{j|q}^{N} m_{jt} * r_{jt}}{\sum_{j|q}^{N} r_{jt}} \qquad (2)$$

with:

Q industries (q = 1,…,Q),

[11] NAICS is the standard used by federal statistical agencies in classifying business establishments for the purpose of collecting, analyzing, and publishing statistical data related to the U.S. business economy. More information is available at https://www.census.gov/eos/www/naics/.

[12] The 4-digit NAICS classification consists of 287 industries between 1996 and 2016. Of these 287 industries, we consider in our analysis only those that are represented by at least two companies. With our sample based on the Russell 3000 Index and the requirement of at least two companies per industry, we cover, on average, 194 4-digit industries, which corresponds to approximately 93% of companies in the Russell 3000 Index.

[13] Because the natural logarithm is defined for positive values only, we add a 1 to each industry level profit margin prior to its conversion.

[14] In order to mitigate the impact of outliers, we winsorize the profit margins at 0.95 (upper bound) and 0.05 (lower bound).

m_j = net profit margin of company j,
r_j = revenue of company j,
t = years (1996,…,2016).

MHHIΔ: Our main explanatory variable is MHHIΔ. Constructing MHHIΔ proved to be a challenge, because it requires a detailed understanding of each sample company's shareholder structure. In order to describe each company's structure, we source 13F information from Thomson Reuters Spectrum for the years 1996 to 2012 and from WRDS for the years 2013 to 2016. We switch data sources between 2012 and 2013 because of documented reporting errors in Thomson Reuters data, especially for assets held by large institutional investors (Ben-David et al., 2018). As our empirical analysis is based on annual data, we use data with a reporting date of December 31 of each year. In total, we process more than 11 million observations extracted from these two data sources.

A closer inspection of the information contained in the retrieved 13F filings, however, still revealed inconsistencies even after switching data sources. In order to mitigate possible distortions as a result of incorrect data, we apply four adjustments: (1) we remove duplicated 13F filings in order to avoid double counting, (2) we remove or, if possible, adjust, 13F filings that exceed 100% of a company's shares outstanding, (3) we fill gaps from missing 13F filings, and (4) we remove all stocks for which the 13F reported holding is below 5% of the company's shares outstanding.[15,16]

In attempting to treat institutional owners at an aggregated (i.e., parent) level rather than as disaggregated subsidiaries, we manually link institutional investors' filings as sourced from Thomson Reuters Spectrum to their parent companies and use phone numbers and street addresses to link institutional investors from WRDS to their parent companies.[17]

[15] In order to control for the impact of these filters on our empirical results presented and discussed hereafter, we reran all analyses without the application of filters (2) to (4). Please refer to the discussion of sensitivity analysis in section 6.3 for further information.
[16] Please refer to the Appendix for a detailed discussion of the treatment of 13F-related data.
[17] We show details of how we tag institutional investors with their parent companies in WRDS in the Appendix.

We then link the ownership data from Thomson Reuters Spectrum and WRDS with historical CUSIP and shares outstanding of a given stock sourced from FactSet to calculate the percentage ownership of institutional investors, at their parent level, in a given company between 1996 and 2016.

Based on this ownership data, we specify MHHIΔ as in equation (1). Revenue information used to compute s_j is taken from Compustat. In the Appendix, we document how we further process 13F data, rules to link institutional investors to parent companies, and how to link Compustat data with Thomson Reuters data and WRDS data.

13F filings require investors to distinguish between "sole," "shared," and "no voting authority" shares. As we observe significant shifts in the way that shares are assigned to these categories, we base our analysis on the aggregate of all three categories. However, for robustness tests, we rerun our regressions based on "sole" voting rights only.

Alternative MHHIΔ specifications: In light of (a) the interaction between MHHIΔ and HHI and (b) the sensitivity of MHHIΔ to assumptions made with regard to unknown investors as discussed in section 3, we calculate three alternative specifications of MHHIΔ by varying the assumptions made with regard to both the market structure and the shareholder structure:

Alternative MHHIΔ specification (a): As discussed above, the explanatory variables HHI and MHHIΔ both depend on companies' market share (s_i) as an input parameter, which may introduce multicollinearity issues. We therefore recalculate MHHIΔ by assuming the market shares of our sample companies are equally distributed within each industry. Hence, s_i is no longer a determinant of this alternative specification, hereafter termed MHHIΔ (equal share).[18] While an equal-market-share assumption may distort the level of the MHHIΔ measure, it should not prevent it from correctly picking up the effect of

[18] As a result of this adjustment in MHHIΔ, the correlation between HHI and MHHIΔ in our empirical analysis changed from –0.63 (HHI and MHHIΔ (traditional)) to –0.35 (HHI and MHHIΔ (equal share)) (see Table A1 in the Appendix). The reduction in this negative relationship makes intuitive sense. As discussed and shown in Figure 1, MHHIΔ (HHI) becomes smaller the more unbalanced the market share is. Neutralizing the impact of market share on MHHIΔ also neutralizes this negative relationship, leading to the correlation coefficient's becoming less negative.

higher common ownership over time or across industries, as measured by the ownership and control incentive terms.

Alternative MHHIΔ specification (b): Given that MHHIΔ is dependent not only on the extent and distribution of holdings of common owners but also on the extent and distribution of known noncommon owners, we recalculate MHHIΔ by assuming that the remainder of shares that are not explained by institutional 13F investors is held by one large noncommon owner per company rather than by small dispersed retail investors. Hence, we fill the gap left in the institutional ownership data by assuming that unknown owners are large individual noncommon owners (i.e., each owning only one company in the industry). We construct this alternative measure to assess the sensitivity of our findings to assumptions made with regard to the portion of shares not explained by 13F investors. The conventional MHHIΔ may be interpreted as an "upper" bound of the "true" MHHIΔ. The true MHHIΔ is identical to this upper bound if shareholders not captured by 13F filings are, indeed, millions of dispersed shareholders with no ownership overlap. This alternative specification can be considered a lower bound of the true MHHIΔ, as it assumes that the entirety of the non-13F investors comprise large individual noncommon owners (i.e., each owning only one company in the industry). In reality, the true MHHIΔ is likely somewhere in between.[19] The resulting variable is hereafter termed MHHIΔ (nc owner).

Alternative MHHIΔ specification (c): This specification of MHHIΔ is based on the assumption that the entire shareholder structure of each company is explained by 13F investors. It may be considered as a complement to alternative (b). Rather than filling the gap with one noncommon owner, we fill the gap by rescaling all 13F investors to sum to 100%. This measure is hereafter termed MHHIΔ (rescaled). Again, our intention is to assess the sensitivity of our results to changes in the assumption made with regard to the unexplained part of each sample company's shareholder structure. One caveat of this measure, however, is

[19] Please refer to Figure 3 for a comparison of the empirical values of our alternative MHHIΔ specifications.

that the rescaling of 13F holdings changes the distributions of common ownership across companies, as the absolute share of 13F positions prior to the rescaling is not identical across companies.

HHI: In order to control for the possible impact of industry-level concentration on profit margins, we add HHI, as specified in equation (1), as a control variable. The rationale for its addition is the assumption that highly concentrated industries may allow the larger companies to have greater influence relative to smaller companies when it comes to setting their optimal price and/or output level, hence increasing their profit margins. Similar to MHHIΔ, revenue information used to compute market share (s_j) is taken from Compustat.

Industry size (IS): One may assume that the size of an industry has an impact on the profit margins of companies belonging to that industry. Larger industries may have matured to some extent and profit margins may be higher as compared with smaller industries with a potentially higher growth character. In order to control for a potential impact of industry size on profit margins, we define the variable industry size (IS). To calculate IS, we added the portfolio weight of each stock in the Russell 3000 Index to its industry level between 1996 and 2016:

$$IS_{qt} = \frac{\sum_{j|q}^{N} MC_{jt}}{\sum_{j} MC_{jt}} \quad (3)$$

with:

MC_j market capitalization of company j

Cost (C): As specified above, the dependent variable profit margin is driven by two components, revenue and costs. The existing literature and underlying theory link common ownership to product prices and/or output levels. Both variables would primarily impact revenue, rather than costs. Therefore, we introduce a third control variable, cost (C), calculated as the ratio of input costs (IC) and labor costs (LC) divided by the total output (O) of an industry q. The data is sourced from the BEA as reported on a 2-digit or 3-digit NAICS level. Because our analysis is based on a more granular 4-digit level, we map each 4-digit

industry to its corresponding 2-digit or 3-digit level. Hence, the costs variable is identical for all 4-digit NAICS industries that belong to the same superordinate 3-digit industry (with a total number of 58).

$$C_{qt} = \frac{IC_{qt} + LC_{qt}}{O_{qt}} \quad (4)$$

Domestic share (DS): Further, we control for the share of total revenue that companies derive domestically (DS), i.e., within the United States. For example, one may assume that companies in the leisure industry draw a higher share of revenue domestically than tech companies. Combing DS with HHI may present a more accurate picture of market conditions in the United States. In order to proxy the degree to which an industry is relying on the domestic market, we compute the share of each U.S. company's revenue that is generated within the United States. The assumption behind these measures is that companies that generate a significant portion of their revenues domestically are less affected by global competition, compared with those companies that generate a significant portion of their revenue abroad. We source the share of revenue owned by each company in the Russell 3000 Index from FactSet and revenue-weight DS to an industry level.

$$DS_{qt} = \frac{\sum_{j|q}^{N} l_{jt} * r_{jt}}{\sum_{j|q}^{N} r_{jt}} \quad (5)$$

with:

l_j = share of total revenues of company j generated inside of the U.S.

Global competition (GC): Lastly, we account for the level of competition an industry faces by other companies domiciled outside the United States (global competition (GC)). This is important because our measure of common ownership is based on the assumption that each sample company's set of competitors is exclusively described by other U.S.-domiciled companies belonging to the same industry. In reality, however, U.S.-domiciled companies may face significant competition from companies domiciled outside the United States. In order to model global competition, we compute the share of industry-level revenues

of Russell 3000 companies relative to global revenue (i.e., U.S. and ex-U.S. industry-level revenues), using company-level revenue sourced from FactSet. The non-U.S. universe is measured by the constituents of the MSCI EAFE Index, the MSCI Canada Index, and the MSCI Emerging Markets Index (or the FTSE Emerging Markets Index and the MSCI South Korea Index).[20]

$$GC_{qt} = \frac{\sum_{j|q,US}^{J} r_{jt}}{\sum_{j|q,US}^{J} r_{jt} + \sum_{j|q,\overline{US}}^{J} r_{jt}} \quad (6)$$

5 Model specification

Based on the dependent and independent variables as specified above, we construct the following static regression model.

$$PM_{qt} = \beta_1 MHHI\Delta_{qt} + \beta_2 HHI_{qt} + \beta_3 IS_{qt} + \beta_4 C_{qt} + \beta_5 DS_{qt} + \beta_6 GC_{qt} + \alpha_q + D_t + \varepsilon_{qt} \quad (7)$$

Hereby, we account for industry fixed effects (α_q). Time-fixed effects D_t are accounted for by the addition of binary year controls. Further, the model is specified as a log-log model with all variables entering the regression with their natural logarithm. In the presence of heteroscedasticity as confirmed by the Breusch-Pagan test, all regressions are run using robust standard errors.

In order to test the sensitivity of our results to model variations, we run our analyses based not only on the full scope of the model described above but also on reduced sets of control variables. Model (M1) hereby includes only the concentration (HHI) and common ownership measure (MHHIΔ), model (M2) uses industry size (IS) and cost (C) as additional independent variables, and model (M3) further adds the proxy for global competition (GC) and the share of revenue derived domestically (DS).[21]

[20] For data availability reasons, we replace the MSCI Emerging Markets Index with the FTSE Emerging Markets Index and MSCI South Korea Index for the period 2013 to 2016 to remove possible overlaps in index constituents. See FTSE Russell Indexes and MSCI Indexes for detailed information about the respective index construction methodologies.

[21] Because the data underlying the variables GC and DS are available only as of 2002, model M3 is tested based on a reduced sample size ranging from 2002 to 2016. In order to disentangle the effect of adding these two controls from the simultaneous effect of a reduction in the sample period, we reran our analyses by moving the start date from 1996 to 2002. Please refer to the discussion of sensitivity analyses in section 4 for further information.

To identify possible changes over time, we further split our sample into the pre- and post-global financial crisis period—1996–2007 and 2008–2016.

As pointed out above, regressions of prices on HHI and/or MHHIΔ can lead to endogeneity issues: Company-level revenue is used in the calculation of profit margins (LHS-variable) as well as of HHI and MHHIΔ (RHS-variables), and the independent variable cost (C) is another component of the LHS-variable profit margin.

Further, industry profitability tends to be highly persistent, so first-order dynamic effects in our dependent variable are very likely. The problem is that the presence of a lagged-dependent variable necessarily introduces correlation between the regressors and the error term in the equation. In order to test and adequately treat this feature of our data, we additionally specify a dynamic panel data model as in equation 8. We estimate this model with a GMM IV. The GMM IV technique also allows us to address the potential simultaneity issue in our variables. We treat all dependent variables as predetermined and use their previous two lags as instruments.

$$PM_{qt} = \beta_1 PM_{qt-1} + \beta_2 MHHI\Delta_{qt} + \beta_3 HHI_{qt} + \beta_4 IS_{qt} + \beta_5 C_{qt} + \beta_6 DS_{qt} + \beta_7 GC_{qt} + D_t + \varepsilon_{qt} \quad (8)$$

In order to assess the validity of the model, we run various tests. In light of heteroscedasticity, we use the two-step GMM estimator with Windmeijer (2005) robust standard errors. The Arellano-Bond test for zero autocorrelations confirms no autocorrelation in first differences errors. Lastly, the Hansen test confirms that over-identification restrictions are valid in the vast majority of our models.

For each model, static and dynamic, we further specify a battery of robustness tests by changing a range of model specifications as discussed thus far.[22]

6 Empirical results

[22] Please refer to the Appendix for an overview of the sensitivity analysis and for a detailed discussion of these robustness tests.

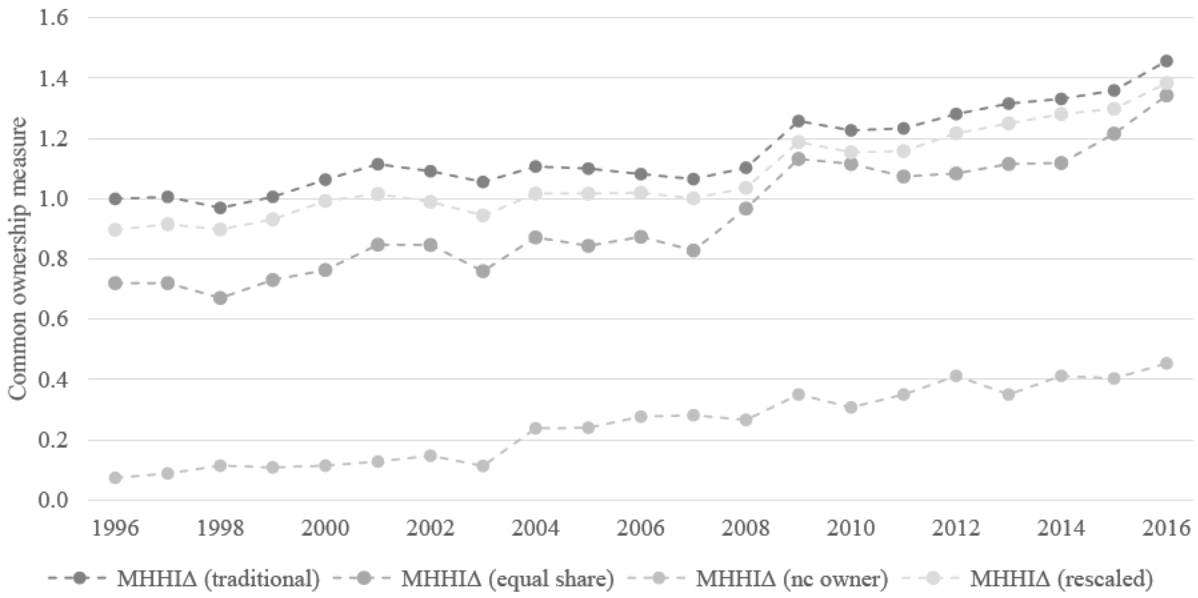
6.1 Sample characteristics

Before discussing the regression results in more detail, we start by providing additional information on the characteristics of our sample and constructed variables.

Figure 3 shows the development of MHHIΔ by following all four approaches discussed above.[23] An immediate observation is the level deviation among the different MHHIΔ measures. The traditional measure has the highest value throughout, followed by MHHIΔ (rescaled), MHHIΔ (equal share), and MHHIΔ (nc owner). MHHIΔ (nc owner) being the lowest of the four measures makes intuitive sense, because large noncommon owners (which are assumed to account for the unexplained share of every company's shareholder base) work as a "corrective" to common owners, hence reducing MHHIΔ.

Figure 3 further shows that all four measures increase over time. However, the increase was not steady but was interrupted by periods of relative stability or even temporary decline.

Figure 3: Development of MHHIΔ specifications over time



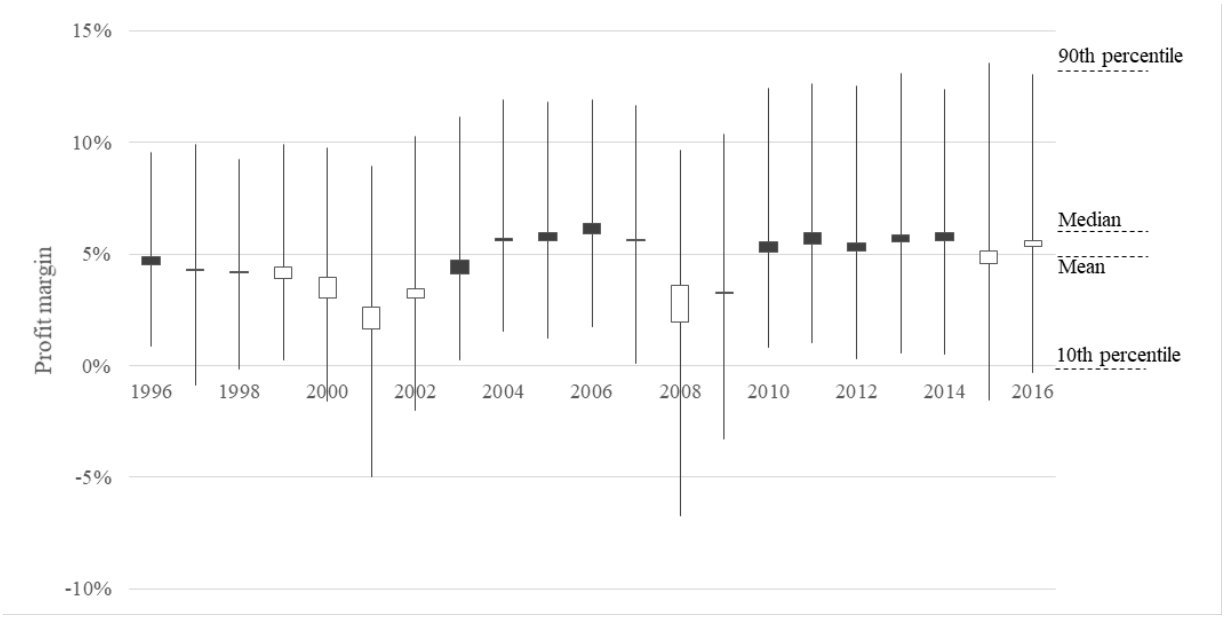
[23] In order to facilitate the comparison of the different MHHIΔ measures, we rescaled all measures to equate with the traditional MHHIΔ measure equal to 1 in 1996.

Development of MHHIΔ, MHHIΔ (equal share), MHHIΔ (nc owner), and MHHIΔ (rescaled) from 1996 to 2016.

A simple scatter plot of the dependent variable profit margin and our measures of MHHIΔ does not indicate a systematic relationship between the two variables (see Figure A1 of the Appendix).

The analysis of our dependent variable, profit margin, shows quite some variability over the course of the time period observed (see Figure 4). Margins were significantly negatively affected by the 2001 dot-com crash and the 2008 global financial crisis but steadily recovered in subsequent years.

Figure 4: Distribution of dependent variable "profit margin" over time



Distribution of dependent variable "profit margin" from 1996 to 2016. Each year is described by the median, the mean, the 90th percentile, and the 10th percentile across all industry-year profit margins. The box is black if the mean is higher than the median and white if the mean is lower than the median.

Table 1 provides additional statistics describing the distribution of the dependent variable and all explanatory variables as measured over the entire sample period, from 1996 to 2016.

Across the time period observed, our sample covers a time-mean of 194 4-digit NAICS industries with a mean of 14 companies per industry. Profit margin has a mean of 4.74%, with a standard deviation of 6.23%. The mean of industry size is 0.51%. Cost, calculated as the sum of input and labor costs as a proportion of total output, has a mean of 82.04%, with 80% of all observations falling into the range from 65.24% to 92.84%. Domestic share, quantifying the share of revenues that our sample companies generate within the United States, has a mean of 72.60%, with a standard deviation of 20.84%. Lastly, global competition's mean of 57.29% indicates that within our sample, the majority of the average industry's revenue is generated by U.S.-domiciled companies.

Table 1: Summary statistics of dependent and independent variables

Variable	Mean	Median	90th percentile	10th percentile	Standard deviation
Number of industries	194	194	200	187	5
Number of companies per industry	14	6	29	2	24
Profit margin (PM)	4.74%	4.71%	11.20%	-0.33%	6.23%
HHI	3,676.4	3,238.4	6,642.0	1,205.7	2,133.3
MHHIΔ (traditional)	2,476.0	2,284.4	4,594.1	595.0	1,528.6
MHHIΔ (equal share)	2476.1	2284.4	4594.1	595.0	1528.6
MHHIΔ (nc owner)	2507.1	2414.6	4003.3	1060.0	1192.8
MHHIΔ (rescaled)	815.1	595.7	1894.6	65.6	753.3
Industry size (IS)	0.51%	0.11%	1.37%	0.12%	1.11%
Cost (C)	82.04%	84.22%	92.84%	65.24%	10.76%
Domestic share (DS)	72.60%	75.34%	98.28%	44.09%	20.84%
Global competition (GC)	57.29%	53.62%	100.00%	14.17%	32.06%

Statistics describing the distribution of dependent and independent variables used in regression analysis. All figures are based on industry-year observations calculated based on 4-digit NAICS industry classification, with a minimum of two companies per industry. There are 4,096 industry-year combinations in our sample. Time period observed: 1996 to 2016.

6.2 Regression results

The results of our base-case regressions are provided in Tables 2 through 5. Table 2 contains the results of the static fixed effects regression, while Table 4 contains the results for the dynamic panel regression.

Models M1 to M3, with their varying controls as specified in section 4, are duplicated three times as a result of the use of our three alternative specifications of MHHIΔ. Models M4 to M6 are based on MHHIΔ (equal share), models M7 to M9 use MHHIΔ (nc owner), and models M10 to M12 use MHHIΔ (rescaled) as the explanatory variable. For brevity, we report only the coefficients and standard errors of HHI and the different MHHIΔ measures for the sub-period regressions covering the years 1996–2007 and 2008–2016 (see Tables 3 and 5).[24]

[24] Please refer to the Appendix for the full regression table.

Table 2: Regression results – dependent variable: profit margin [4-digit NAICS | 1996-2016 | unbalanced | static panel]

4-digit NAICS | 1996-2016 | unbalanced | static panel												
	MHHIΔ (traditional)			MHHIΔ (equal share)			MHHIΔ (nc owner)			MHHIΔ (rescaled)		
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
HHI	0.0076	0.0117	0.0108	0.0028	0.0093	0.0097	0.0101	0.0130	0.0108	0.0095	0.0127	0.0109
	(0.0104)	(0.0102)	(0.0129)	(0.0093)	(0.0092)	(0.0117)	(0.0096)	(0.0095)	(0.0121)	(0.0104)	(0.0102)	(0.0129)
MHHIΔ (traditional)	0.0076*	0.0028	0.0008									
	(0.0046)	(0.0042)	(0.0039)									
MHHIΔ (equal share)				0.0052	-0.0024	-0.0043						
				(0.0057)	(0.0055)	(0.0043)						
MHHIΔ (nc owner)							0.0096***	0.0044	0.0008			
							(0.0032)	(0.003)	(0.0029)			
MHHIΔ (rescaled)										0.0075	0.0052	-0.0042
										(0.0044)	(0.0041)	(0.006)
IS		0.0253****	0.0347****		0.026****	0.0353****		0.0241****	0.0346****		0.0249****	0.0346****
		(0.0037)	(0.0046)		(0.0036)	(0.0047)		(0.0037)	(0.0046)		(0.0037)	(0.0047)
C		-0.0582	-0.0739*		-0.0567	-0.0731		-0.0573	-0.0733*		-0.0588	-0.074*
		(0.0452)	(0.0452)		(0.0456)	(0.0456)		(0.0449)	(0.0457)		(0.045)	(0.0452)
DS			0.0173			0.0177			0.0172			0.0173
			(0.0144)			(0.0146)			(0.0145)			(0.0144)
GC			0.0025			0.0028			0.0026			0.0025
			(0.0071)			(0.007)			(0.0071)			(0.0071)
Const.	-0.0660	-0.0241	0.0055	-0.0106	0.0353	0.0549	-0.0744	-0.0361	0.0066	-0.1001	-0.0436	0.0034
	(0.1052)	(0.0984)	(0.1138)	(0.096)	(0.0914)	(0.0983)	(0.0834)	(0.077)	(0.0965)	(0.1068)	(0.0992)	(0.1161)
R^2	0.0455	0.0957	0.1047	0.0443	0.0962	0.1059	0.0359	0.0976	0.1048	0.0490	0.0959	0.1047
# of industry-year observations	4078	4078	2928	4078	4078	2928	4078	4078	2928	4078	4078	2928

Regression results according to equation (7) and derived models M1 to M12. *,**,***,**** indicate statistical significance at the 0.1, 0.05, 0.01, and 0.001 level, respectively. Standard errors are provided in parentheses.

Table 3: Regression results – dependent variable: profit margin [4-digit NAICS | sub-periods | unbalanced | static panel]

4-digit NAICS | 1996-2007 | unbalanced | static panel												
	MHHIΔ (traditional)			MHHIΔ (equal share)			MHHIΔ (nc owner)			MHHIΔ (rescaled)		
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
HHI	0.0010	0.0040	-0.0036	-0.0039	0.0003	-0.0013	0.0044	0.0062	-0.0012	0.0035	0.0056	-0.0027
	(0.0087)	(0.009)	(0.0114)	(0.0072)	(0.0077)	(0.0114)	(0.0074)	(0.0077)	(0.0111)	(0.0086)	(0.0088)	(0.0115)
MHHIΔ (traditional)	0.0075	0.0052	-0.0042									
	(0.006)	(0.0059)	(0.0048)									
MHHIΔ (equal share)				0.0046	0.0013	-0.0057						
				(0.0065)	(0.0067)	(0.0053)						
MHHIΔ (nc owner)							0.011***	0.0086**	-0.0011			
							(0.0042)	(0.0043)	(0.0041)			
MHHIΔ (rescaled)										0.0139*	0.0064	0.0066
										(0.0063)	(0.0049)	(0.0073)
# of industry-year observations	2294	2294	1145	2294	2294	1145	2294	2294	1145	2294	2294	1145
4-digit NAICS | 2008-2016 | min. 2 companies | unbalanced | static panel												
HHI	0.0053	0.0182	0.0179	-0.0030	0.0133	0.0129	0.0066	0.0147	0.0143	0.0058	0.0168	0.0165
	(0.0219)	(0.0201)	(0.0205)	(0.0196)	(0.0179)	(0.0182)	(0.0199)	(0.0183)	(0.0186)	(0.0218)	(0.0202)	(0.0206)
MHHIΔ (traditional)	0.0139*	0.0064	0.0066									
	(0.0073)	(0.0066)	(0.0069)									
MHHIΔ (equal share)				0.0100	-0.0053	-0.0054						
				(0.0081)	(0.0076)	(0.0078)						
MHHIΔ (nc owner)							0.0125**	0.0010	0.0010			
							(0.0049)	(0.0043)	(0.0044)			
MHHIΔ (rescaled)										0.0304*	0.0209	-0.0061
										(0.0068)	(0.0071)	(0.0166)
# of industry-year observations	1784	1784	1783	1784	1784	1783	1784	1784	1783	1784	1784	1783

Regression results according to equation (7) and derived models M1 to M12. *,**,***,**** indicate statistical significance at the 0.1, 0.05, 0.01, and 0.001 level, respectively. Standard errors are provided in parentheses.

Table 4: Regression results – dependent variable: profit margin [4-digit NAICS | 1996-2016 | unbalanced | dynamic panel (2 lags | 2-step)]

4-digit NAICS | 1996-2016 | unbalanced | dynamic panel (2 lags | 2-step)												
	MHHIΔ (traditional)			MHHIΔ (equal share)			MHHIΔ (nc owner)			MHHIΔ (rescaled)		
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
PM (t-1)	0.2929****	0.2532****	0.2272****	0.2855****	0.2522****	0.2265****	0.2842****	0.2497****	0.2269****	0.2888****	0.2502****	0.2271****
	(0.0463)	(0.0474)	(0.056)	(0.0481)	(0.0463)	(0.0558)	(0.043)	(0.0465)	(0.0556)	(0.0462)	(0.0466)	(0.0558)
HHI	0.0304*	0.0209	-0.0061	0.0210	0.0194	-0.0034	0.0337**	0.0236	-0.0064	0.0307*	0.0216	-0.0047
	(0.0166)	(0.0174)	(0.0184)	(0.0153)	(0.0163)	(0.0205)	(0.0157)	(0.0164)	(0.0163)	(0.0161)	(0.017)	(0.0181)
MHHIΔ (traditional)	0.0056	0.0056	-0.0055									
	(0.0057)	(0.0065)	(0.0047)									
MHHIΔ (equal share)				0.0017	0.0034	-0.0061						
				(0.0083)	(0.0097)	(0.0053)						
MHHIΔ (nc owner)							0.0048	0.0055	-0.0014			
							(0.004)	(0.006)	(0.0042)			
MHHIΔ (rescaled)										0.0070	0.0069	-0.0045
										(0.0059)	(0.0075)	(0.0053)
IS		0.0305****	0.041****		0.0278***	0.0407***		0.0236**	0.0409***		0.0295***	0.0402****
		(0.009)	(0.0123)		(0.0098)	(0.0138)		(0.0104)	(0.0134)		(0.0092)	(0.0118)
C		-0.0908	0.0606		-0.0643	0.0659		-0.0766	0.0472		-0.0930	0.0500
		(0.0815)	(0.1203)		(0.0818)	(0.1149)		(0.0804)	(0.1231)		(0.0812)	(0.119)
DS			-0.0162			-0.0166			-0.0189			-0.0167
			(0.0175)			(0.017)			(0.0167)			(0.0174)
GC			-0.0264			-0.0273*			-0.0215			-0.0233
			(0.0176)			(0.0153)			(0.0169)			(0.0174)
AB 2 (p)	0.9770	0.9750	0.2170	0.9410	0.9920	0.2380	0.8750	0.9270	0.2090	0.9490	0.9940	0.2150
Hansen (p)	0.1290	0.2830	0.4180	0.2530	0.4040	0.4690	0.2190	0.3030	0.2960	0.1370	0.2870	0.3870
# of industry-year observations	3530	3530	2618	3530	3530	2618	3530	3530	2618	3530	3530	2618

Regression results according to equation (8) and derived models M1 to M12. *,**,***,**** indicate statistical significance at the 0.1, 0.05, 0.01, and 0.001 level, respectively. Standard errors are provided in parentheses.

Table 5: Regression results – dependent variable: profit margin [4-digit NAICS | sub-periods | unbalanced | dynamic panel (2 lags | 2-step)]

4-digit NAICS | 1996-2007 | unbalanced | dynamic panel (2 lags | 2-step)												
	MHHIΔ (traditional)			MHHIΔ (equal share)			MHHIΔ (nc owner)			MHHIΔ (rescaled)		
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
HHI	0.0187	0.0196	-0.0235	0.0083	0.0123	-0.0219	0.0321	0.0203	-0.0143	0.0202	0.0162	-0.0188
	(0.0196)	(0.0217)	(0.0304)	(0.021)	(0.0227)	(0.0324)	(0.0222)	(0.0237)	(0.0296)	(0.0183)	(0.0224)	(0.0302)
MHHIΔ (traditional)	0.0107	0.0115	-0.0044									
	(0.0083)	(0.0088)	(0.0059)									
MHHIΔ (equal share)				0.0052	0.0037	-0.0047						
				(0.0092)	(0.0097)	(0.0052)						
MHHIΔ (nc owner)							0.0071	0.0100	-0.0046			
							(0.0055)	(0.0074)	(0.0044)			
MHHIΔ (rescaled)										0.0121	0.0133	-0.0025
										(0.0083)	(0.0094)	(0.0073)
# of industry-year observations	1814	1814	903	1814	1814	903	1814	1814	903	1814	1814	903
4-digit NAICS | 2008-2016 | min. 2 companies | unbalanced | dynamic panel (2 lags | 2-step)												
HHI	-0.0045	0.0496	0.0408	0.0046	0.0519	0.0384	-0.0437	0.0307	0.0306	-0.0235	0.0444	0.0360
	(0.0369)	(0.0347)	(0.0351)	(0.0324)	(0.0341)	(0.0326)	(0.0378)	(0.0316)	(0.0369)	(0.0302)	(0.0353)	(0.0354)
MHHIΔ (traditional)	0.0116	-0.0069	-0.0056									
	(0.0111)	(0.0099)	(0.0084)									
MHHIΔ (equal share)				-0.0092	-0.0349***	-0.0297***						
				(0.011)	(0.0122)	(0.0108)						
MHHIΔ (nc owner)							0.0049	-0.0108	-0.0092			
							(0.0048)	(0.0139)	(0.008)			
MHHIΔ (rescaled)										0.0101	-0.0085	-0.0066
										(0.0096)	(0.0106)	(0.0096)
# of industry-year observations	1339	1339	1339	1339	1339	1339	1339	1339	1339	1339	1339	1339

Regression results according to equation (8) and derived models M1 to M12. *,**,***,**** indicate statistical significance at the 0.1, 0.05, 0.01, and 0.001 level, respectively. Standard errors are provided in parentheses.

Static panel

In the extended model covering 1996–2016, the relationship between the traditional measure of MHHIΔ and industry profitability is found to be positive and statistically significant in only two (M1 and M7) of 12 regression specifications. These two models, based on MHHIΔ (traditional) and MHHIΔ (nc owner) apply no control variable other than HHI. The regression coefficients of these two specifications indicate that a 1% increase in MHHIΔ leads to an approximate increase in our dependent variable by 0.008% for MHHIΔ (traditional) and 0.010% MHHIΔ (nc owner). Or, to put it differently, an increase in MHHIΔ (traditional) [MHHI (nc owner)] by one standard deviation relative to its mean leads to an increase in profit margins by 0.40% [0.68%].[27] Hence, the economic significance is very small. Once controls are included, none of our static regressions finds a positive and statistically significant relationship between MHHIΔ and profit margin.

When investigating the two subperiods rather than the entire sample, we observe only smaller changes in the impact of MHHIΔ (traditional) and its variations on industry profit margins. In both subperiods, the vast majority of specifications indicate no significance. MHHIΔ (traditional) is found to be significant only in the second half of the sample (see model M1 in Table 3). The coefficient of approximately 0.014% suggests that the magnitude of the increase in the dependent variable as a result of a 1% increase in MHHIΔ (traditional) has increased slightly compared with that observed in the overall sample. MHHIΔ (nc owner) and MHHIΔ (rescaled) appear to be significant in both subperiods (see models M7, M8, and M9 in Table 3). But again, the addition of controls renders all MHHIΔ-related coefficients insignificant. MHHIΔ (equal share) fails to be significant in any of our specifications.

In line with common expectations, the sign of the coefficient of HHI as control for the impact of market concentration is found to be positive across most static models, indicating that more concentrated industries

[27] Please refer to Table 1 for an overview of means and standard deviations of all dependent and independent variables.

tend to have higher profit margins. However, its impact is not found to be statistically significant at the 10% level.

The regression coefficient of cost (C) has a negative sign in all models and is statistically significant in 19 of 24 static models.[28] Accordingly, its statistical and economic significance is highest in the first half of our sample with coefficients reaching levels around –0.165, indicating an approximate 0.165% reduction in profit margin as a result of a 1% increase in costs (C). This makes intuitive sense, as costs are inversely related to profit margins. Our control for industry size (IS) is found to be positively related with profitability and highly significant in all static models. In fact, with statistical significance to the 0.1% level in most specifications, it is the variable with the highest significance across our model specifications. In economic terms, its impact is the highest in the second half of our sample with regression coefficients reaching 0.0549, indicating that a 1% change in this variable leads to an approximate increase in profit margin of 0.0549%. Hence, relatively larger industries tend to be more profitable. The controls for domestic share (DS) and global competition (GC), on the other hand, are not found to have a statistically significant impact on industry profitability.

Dynamic panel

When moving from the static to the dynamic panel approach, we observe important changes in our regression results.

The regression coefficient of the lagged dependent variable is found to be positive and highly significant throughout, indicating the significance of profit margins in point in time t for its value in t+1.

Most notably, the relationship between MHHIΔ and profitability becomes insignificant in almost all models tested (see Tables 4 and 5). The sole exception occurs in the context of MHHIΔ (equal share)

[28] Please note: The total number of models per specification is 36 (models M1 to M12 measured over the course of the full length of our sample period as well as over the course of the two sub-sample periods (1996–2007 and 2008–2016). The total number of regression models in which the variable costs (C) is used is 24 rather than 36, as models M1, M4, M7, and M10 do not include costs as an explanatory variable.

measured over the course of the second half of the overall sample period. MHHIΔ (equal share) is now found to be significant but with a negative sign, indicating a negative relationship between this specification of common ownership and industry profit margins (see models M5 and M6 in Table 5). In absolute terms, these negative coefficients of MHHIΔ are higher than all previously observed coefficients, indicating that a 1% increase in MHHIΔ (equal share) is corresponding to a reduction in our dependent variable by as much as 0.035%.

The signs and significance of the regression coefficients of most of our control variables remain largely unchanged compared with those in the static model. The sign of the regression coefficient HHI continues to be positive in most specifications. Again, industry size (IS) is found to have a positive relationship with profit margins and continues to have the highest significance. Also, the regression coefficient of cost (C) is still negative in most subsample specifications. However, its significance is somewhat reduced. Domestic share (DS) remains mostly insignificant. However, global competition (GC) is now found to be negative and significant in some specifications, indicating that U.S. companies operating in industries in which the U.S. market share is relatively lower tend to be less profitable.

Specifications of MHHIΔ

We find that our regression results with regard to MHHIΔ tend to be largely robust across the different specifications of MHHIΔ. Although none of our MHHIΔ specifications is positive and significant in dynamic models, we observe a slightly increased significance of MHHIΔ (nc owner) and a reduced significance of MHHIΔ (equal share) relative to MHHIΔ (traditional). The reason for the reduction in the significance of MHHIΔ (equal share) may indicate that it is the distribution of market share, rather than common ownership-related implications, which leads to the sporadic significance of MHHIΔ in some of our model specifications.

6.3 Robustness tests

In order to test the sensitivity of our 4-digit base-case model to changes in design specifications, we rerun all models after changing a range of design components one at a time:

(1) Rather than applying an unbalanced panel, we "enforce" a balanced structure. Hence, we disregard all industries that do not exist over all 21 years observed.

(2) Following Azar, Schmalz, and Tecu (2018), we disregard all 13F investor holdings of less than 0.5%, assuming that they would not exert much influence over companies.

(3) 13F filings require investors to distinguish between "sole," "shared," and "no voting authority" shares. As we observe significant shifts in the way shares are assigned to these categories, we base our base-case analysis on the aggregate of all three categories. In order to test the sensitivity of our results to changes in the treatment of voting rights, we rerun our analyses based on "sole" voting rights only.

(4) Further, we test the sensitivity of our results to changes in the granularity of the industry level by rerunning all regressions based on the NAICS 3-digit rather than the NAICS 4-digit level.

(5) Due to a lack of availability of two of our controls, domestic share (DS) and global competition (GS), in years prior to 2002, we rerun all models that initially started in 1996 (i.e., the overall model and the first sub-sample model) with an adjusted base year of 2002.

(6) Further, we remove the winsorization of the dependent variable.

(7) In addition to (6), we further remove all filters applied to the underlying 13F filings except for the removal of duplicated 13F filings.[29]

(8) Lastly, and specific to dynamic panels, we test the sensitivity of regression results by increasing the number of lags used to instrument variables from 2 (base case) to 3.

Moving from an unbalanced to a balanced panel structure leads to a reduction in the number of industries, as those industries that newly came into existence after 1996 or disappeared over the course of

[29] We keep the removal of duplications in place, as these appear to be obvious mistakes.

the sample period are deliberately ignored. The same holds true for industries with "gaps" over time. A reduction in the number of industries also occurs when moving from an NAICS 4-digit to an NAICS 3-digit industry granularity. The choice of a balanced panel reduces the number of industries to a constant 154 over time, whereas the move to a 3-digit NAICS classification reduces the number of industries to a time-weighted average of 56. In terms of companies covered, the balanced panel sacrifices 122 companies on average per year (2,655 instead of 2,777 company-year observations), whereas the use of 3-digit NAICS codes increases the average number of sample companies per year to 2,812.[30]

In order to facilitate the comparison of the impact of these model specifications on the regression coefficient of MHHIΔ, we focus on a qualitative rather than a quantitative display of results (see Table 6 for static models and Table 7 for dynamic models). (+) hereby indicates a positive regression coefficient that is statistically significant at the 10% level or below, (-) indicates a negative regression coefficient that is statistically significant at the 10% level or below, and ( ) indicates no significance. [31]

Among static models, and across the various specifications of MHHIΔ, we find the two specifications MHHIΔ (nc owner) and MHHIΔ (rescaled) to have the most instances of positive and statistically significant regression coefficients. However, and in line with our base-case-related observations, significance tends to disappear when controls are added.

Across models, the balanced approach has the highest number of positive and significant observations, with a slightly higher number of positive observations in the second half of the sample period.

All other model variations—(a) the removal of 13F investors that hold less than 0.5%, (b) the exclusive focus on shares with "sole" voting rights, (c) the switch from a 4-digit to a 3-digit NAICS classification, (d) the move of our starting year from 1996 to 2002, and (e) the removal of filters and the removal of the

[30] The impact of these model variations on the number of companies and industries covered is shown in Figures A.1 and A.2 of the Appendix.
[31] Please refer to the Appendix for the full regression tables containing the results of the entire period observed (1996 to 2016). For brevity, we do not provide full regression reports for all subperiods. However, the results can be made available upon request.

winsorization of the dependent variable—lead to a reduction in the number of instances in which MHHIΔ is found to have a positive and statistically significant coefficient.

In line with our base-case specification, a move from static to dynamic regression models substantially reduces the significance of MHHIΔ assessed by the overall number of instances in which our measures of common ownership are found to be positive and statistically significant. Also, the tendency of MHHIΔ (equal share) to be negatively related to profit margins, as observed in our base-case model in the context of the second half of the sample period, is further supported by a variety of alternative dynamic model specifications.

Table 6: Stylized regression coefficients of MHHIΔ – Static panel - Dependent variable: profit margin

Static models - significance and direction of MHHIΔ regression coefficients																				
Model specification									MHHIΔ (traditional)			MHHIΔ (equal share)			MHHIΔ (nc owner)			MHHIΔ (rescaled)		
NAICS-level	Bal. / unbal. ?	Application of data filters?	Dep. variable winsorized?	# of lags (for instruments)	Treatment of instr. matrix	Min. share per 13F investor	13F categories	Time period	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
4-digit	unbal.	yes	yes	--	--	0.0%	All	1996 - 2016	(+)	( )	( )	( )	( )	( )	(+)	( )	( )	( )	( )	( )
								1996 - 2007	( )	( )	( )	( )	( )	( )	(+)	(+)	( )	(+)	( )	( )
								2008 - 2016	(+)	( )	( )	( )	( )	( )	(+)	( )	( )	(+)	( )	( )
4-digit	bal.	yes	yes	--	--	0.0%	All	1996 - 2016	(+)	( )	( )	(+)	( )	( )	(+)	( )	( )	(+)	( )	( )
								1996 - 2007	(+)	( )	( )	( )	( )	( )	(+)	( )	( )	(+)	(+)	(+)
								2008 - 2016	(+)	(+)	(+)	(+)	( )	( )	(+)	(+)	(+)	( )	( )	( )
4-digit	unbal.	yes	yes	--	--	0.5%	All	1996 - 2016	(+)	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )
								1996 - 2007	( )	( )	( )	( )	( )	( )	( )	( )	( )	(+)	( )	( )
								2008 - 2016	(+)	( )	( )	( )	( )	( )	( )	( )	( )	(+)	( )	( )
4-digit	unbal.	no	no	--	--	0.0%	Sole	1996 - 2016	( )	( )	( )	( )	(-)	( )	(+)	( )	( )	(+)	( )	( )
								1996 - 2007	(+)	( )	( )	( )	( )	( )	(+)	(+)	( )	( )	( )	( )
								2008 - 2016	( )	( )	( )	( )	( )	( )	( )	( )	( )	(+)	( )	( )
3-digit	unbal.	yes	yes	--	--	0.0%	All	1996 - 2016	( )	( )	( )	( )	( )	( )	(+)	( )	(+)	( )	( )	( )
								1996 - 2007	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )
								2008 - 2016	( )	( )	( )	( )	( )	( )	( )	( )	( )	(-)	( )	( )
4-digit	unbal.	yes	yes	--	--	0.0%	All	2002 - 2016	( )	( )	( )	( )	( )	( )	(+)	( )	( )	( )	( )	( )
								2002 - 2007	( )	( )	( )	( )	( )	( )	( )	( )	( )	(+)	( )	( )
4-digit	unbal.	yes	no	--	--	0.0%	All	1996 - 2016	( )	( )	( )	( )	(-)	(-)	(+)	( )	( )	( )	( )	( )
								1996 - 2007	( )	( )	( )	( )	( )	( )	(+)	(+)	( )	( )	( )	( )
								2008 - 2016	( )	( )	( )	( )	( )	( )	(+)	( )	( )	( )	( )	( )
4-digit	unbal.	no	no	--	--	0.0%	All	1996 - 2016	( )	( )	( )	( )	(-)	( )	(+)	( )	( )	( )	( )	( )
								1996 - 2007	( )	( )	( )	( )	( )	(-)	(+)	(+)	( )	( )	( )	( )
								2008 - 2016	( )	( )	( )	( )	( )	( )	(+)	( )	( )	(+)	( )	( )

Stylized representation of regression coefficients of the various specifications of MHHIΔ in base-case models and models specified for the purpose of sensitivity analyses. (+) indicates a positive regression coefficient that is statistically significant at 10% or below, (-) indicates a negative regression coefficient that is statistically significant at 10% or below, and ( ) indicates no significance.

Table 7: Stylized regression coefficients of MHHIΔ – Dynamic panel - Dependent variable: profit margin

Dynamic models - significance and direction of MHHIΔ regression coefficients																				
Model specification									MHHIΔ (traditional)			MHHIΔ (equal share)			MHHIΔ (nc owner)			MHHIΔ (rescaled)		
NAICS-level	Bal. / unbal. ?	Application of data filters?	Dep. variable winsorized?	# of lags (for instruments)	Treatment of instr. matrix	Min. share per 13F investor	13F categories	Time period	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
4-digit	unbal.	yes	yes	2	--	0.0%	All	1996 - 2016	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )
								1996 - 2007	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )
								2008 - 2016	( )	( )	( )	( )	(-)	(-)	( )	( )	( )	( )	( )	( )
4-digit	bal.	yes	yes	2	--	0.0%	All	1996 - 2016	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )
								1996 - 2007	(+)	( )	( )	( )	( )	( )	( )	( )	( )	(+)	( )	( )
								2008 - 2016	( )	( )	( )	( )	( )	( )	(+)	( )	( )	( )	( )	(+)
4-digit	unbal.	yes	yes	2	--	0.5%	All	1996 - 2016	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )
								1996 - 2007	( )	(+)	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )
								2008 - 2016	( )	( )	( )	( )	(-)	(-)	( )	( )	( )	( )	( )	( )
4-digit	unbal.	yes	yes	2	--	0.0%	Sole	1996 - 2016	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )
								1996 - 2007	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )
								2008 - 2016	( )	( )	( )	( )	(-)	(-)	( )	( )	( )	( )	( )	( )
3-digit	unbal.	yes	yes	2	col.	0.0%	All	1996 - 2016	(+)	(+)	( )	(+)	( )	( )	( )	( )	( )	( )	( )	( )
								1996 - 2007	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )
								2008 - 2016	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )
4-digit	unbal.	yes	yes	2	--	0.0%	All	2002 - 2016	( )	( )	( )	( )	(-)	( )	( )	( )	( )	( )	( )	( )
								2002 - 2007	( )	( )	( )	( )	( )	( )	(-)	(-)	(-)	( )	( )	( )
4-digit	unbal.	yes	no	2	--	0.0%	All	1996 - 2016	( )	( )	( )	( )	(-)	(-)	( )	( )	( )	( )	( )	( )
								1996 - 2007	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )
								2008 - 2016	( )	( )	( )	( )	(-)	(-)	( )	( )	( )	( )	( )	( )
4-digit	unbal.	no	no	2	--	0.0%	All	1996 - 2016	( )	( )	( )	( )	(-)	( )	( )	( )	( )	( )	( )	( )
								1996 - 2007	( )	( )	( )	( )	(-)	(-)	( )	( )	( )	( )	( )	( )
								2008 - 2016	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )
4-digit	unbal.	yes	yes	3	--	0.0%	All	1996 - 2016	( )	( )	( )	( )	(-)	( )	( )	( )	( )	( )	( )	( )
								1996 - 2007	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )
								2008 - 2016	( )	( )	( )	( )	(-)	(-)	( )	(-)	(-)	( )	(-)	(-)

Stylized representation of regression coefficients of the various specifications of MHHIΔ in base-case models and models specified for the purpose of sensitivity analyses. (+) indicates a positive regression coefficient that is statistically significant at 10% or below, (-) indicates a negative regression coefficient that is statistically significant at 10% or below, and ( ) indicates no significance.

7 Conclusion

Our paper starts with a discussion of the characteristics of MHHIΔ as a frequently used empirical measure to quantify common ownership. We argue that it is important to treat the interpretation of this measure and derived empirical results with caution, as changes in MHHIΔ are driven not only by changes in the structure of common owners; we have theoretically derived cases where the structure of common owners changes without MHHIΔ being impacted. On the other hand, we have identified cases where MHHIΔ changes while the structure of common owners remains unchanged.

The empirical analysis assesses the link between MHHIΔ and industry-level profitability. Rather than focusing on single industries, as the majority of related studies do, we broaden the scope by analyzing the relationship between MHHIΔ and profitability on an industry level. In addition, we also address autocorrelation and simultaneity issues by using dynamic regression models alongside static models.

Our preferred econometric specification is a dynamic panel data model estimated through a GMM IV estimator. Estimation results based on this model confirm the presence of important first-order dynamic effects in our industry profitability variable that otherwise could not be adequately treated with more common estimation techniques such as fixed-effect panel data methods. Additionally, the IV estimator allows us to handle potential endogeneity concerns in our coefficient of interest. In fact, although the initial use of a static (industry and year) fixed-effects model indicates a positive relationship between MHHIΔ and industry-level profit margins in a few selected specifications, the application of a dynamic GMM model either substantially reduces the significance of MHHIΔ or renders this relationship insignificant in the majority of our models.

Our analysis generally fails to find empirical support for the common ownership hypothesis. Rather, our findings indicate that the relationship between our chosen measure of common ownership (MHHIΔ) and profitability is very sensitive to and inconsistent across changes in (1) the choice of the statistical regression model, (2) the control variables used, (3) the time periods observed, and (4) the specification of the measure

to quantify common ownership. We test the statistical relationship predicted by the common ownership hypothesis in light of all possible variations of these modeling specifications.

All investing is subject to risk, including the possible loss of the money you invest.

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Appendix

1. Treatment of 13F filings

We apply the following adjustments to 13-F filings in order to improve data quality:

(1) We observe duplicates in reportings that would incorrectly increase the share of assets held by single 13F investors. Therefore, we remove duplicates.

(2) We detected filings that exceed 100% of a company's shares outstanding. In these cases, we replace a specific investor-company-year observation with the previous year's observation if it was below 100%. If no observation exists for the previous year, which has been so for 8 cases, we remove the respective filing from our database.

(3) In addition to data quality issues in Thomson Reuters data after 2013 as discussed in Ben-David, et al. (2018), Backus, Conlon, and Sinkinson (2019) documented inconsistencies in the Thomson Reuters database that relate specifically to the years 2011 and 2012. Notably, 13F ownership information of many stocks seems to be missing. As a result, the aggregate of shares held by 13F investors decreases from levels well beyond 50% to levels significantly below 10% (p. 46).

We apply the following logic to fill these data gaps:

- If a company's aggregated share of 13F investors is below 10% in 2011 but above 10% in 2010, a comparison of 13F investors' holdings between 2011 and 2010 is made. If a 13F investor held shares in the respective company in 2010 but no reporting is available for 2011, the previous year's reporting is carried forward.
- If a company's aggregated share of 13F investors is below 10% in 2012 but above 10% in 2011, a comparison of 13F investors' holdings between 2012 and 2011 is made. If a 13F investor held shares in the respective company in 2011 but no reporting is available for 2012, the previous year's reporting is carried forward.
- If a company's aggregated share of 13F investors is below 10% in 2012 and 2011 but above 10% in 2010, a comparison of 13F investors' holdings between 2012, 2011, and 2010 is made. If a

13F investor held shares in the respective company in 2010 but no reporting is available for 2011 and 2012, the reporting of 2010 is carried forward.

(4) The treatment described under (3), which specifically targets the years 2011 and 2012, is capable of mitigating the significant distortion due to missing data. However, these steps are not able to detect all missing data issues for these years. Therefore, we remove all companies in which 13F investors account for less than 5%, assuming that these low levels are mainly due to missing data issues.

2. Linking different data sources

In the construction of our empirical model, we collect data from five data sources: Thomson Reuters Spectrum, Wharton Research Data Service (WRDS), Compustat, FactSet, and the Bureau of Economic Analysis (BEA).

The ownership information used in our analysis is based on Form 13F filings as sourced from Thomson Reuters Spectrum for the years 1996 to 2012 and from WRDS from 2013 to 2016. We switched data sources between 2012 and 2013 because of documented reporting errors in Thomson Reuters data, especially for assets held by large institutional investors (Ben-David et al., 2018).

13F data from Thomson Reuters Spectrum is accessed through WRDS. 13F investors are required to file on a quarterly basis. As our analysis is based on a yearly frequency, we refer to each year's fourth-quarter reporting. Therefore, the data within Thomson Reuters Spectrum is organized via mgrno-CUSIP-Year combinations, where mgrno is the identifier of an institutional investor assigned by Thomson Reuters. Importantly, mgrno is not unique and may be recycled in different time periods for different institutional investors. Additionally, some institutional investors have multiple mgrno numbers at their parent level. We undertake significant manual effort to link mgrno numbers to the same parent company for which we then create unique IDs. The Thomson Reuters Spectrum data is reorganized as Unique ID-CUSIP-Year combinations.

Within the WRDS database, information is structured via a Central Index Key (CIK), which is assigned by the SEC and unique to each firm. Because some subsidiary firms have CIKs different from those of their parent companies, we assume CIKs with the same phone numbers to be subsidiaries of their parent companies; we then validate the findings with state addresses of these CIKs. In addition, we manually check the following institutional investors to make sure their subsidiaries are correctly tied to the parent level: AQR Capital Management, Bank of New York Mellon, BlackRock, Bridgewater Associates, Capital Group, Fidelity Investments, The Goldman Sachs Group, Morgan Stanley, Renaissance Investments, Prudential Financial, State Street, T. Rowe Price Group, The Vanguard Group, Two Sigma Investments, and the D.E. Shaw group. For all institutional investors at their parent level, we assign Unique ID for each of them and reorganize the data to Unique ID-CUSIP-Year combinations. We then merge the data with the Thomson Reuters Spectrum data.

The merged ownership is then joined with FactSet data that includes historical CUSIP and shares outstanding between 1996 and 2016 to calculate the ownership of an institutional investor in a giving CUSIP each year. The linked data is then joined with revenue data from Compustat and mapped to 4-digit NAICS to calculate MHHIΔ.

HHI is calculated based on revenue data from Compustat and mapped to 4-digit NAICS for each year.

Industry size (IS) is calculated based on the portfolio weight of each constituent in the Russell 3000 Index and mapped to 4-digit NAICS for each year.

Cost (C) is based on data from Integrated Industry-Level Production Account (KLEMS) from BEA. KLEMS data is by 2-digit or 3-digit NAICS. We mapped the 4-digit NAICS into the KLEMS grouping.

Domestic share (DS) is based on data from FactSet that includes the ratio of revenue drawing from the domestic market for constituents of the Russell 3000 Index. We link the FactSet data with Compustat data based on the ISIN-Year ID and weigh the ratio based on revenue.

We merge data from FactSet with data from Compustat to create global competition (GC). We compute the share of industry-level revenues of Russell 3000 companies (sourced from Compustat) relative to global (i.e., U.S. and ex-U.S. industry-level revenues), using company-level revenue (sourced from FactSet). The

non-U.S. universe is measured by the constituents of the MSCI EAFE Index, the MSCI Canada Index, and the MSCI Emerging Markets Index. Companies from U.S. and ex-U.S. universes are grouped in 4-digit NAICS.

Data from different sources are linked together by the NAICS-Year identifier. Our base model includes 4,078 observations and covers on average 194 industries over 21 years.

General note: We acknowledge that there are various alternative ways to tie institutional investors to their parent companies and to treat issues related to 13F filings. We reserve the testing of the sensitivity of our empirical results to different treatments of data errors for future research.

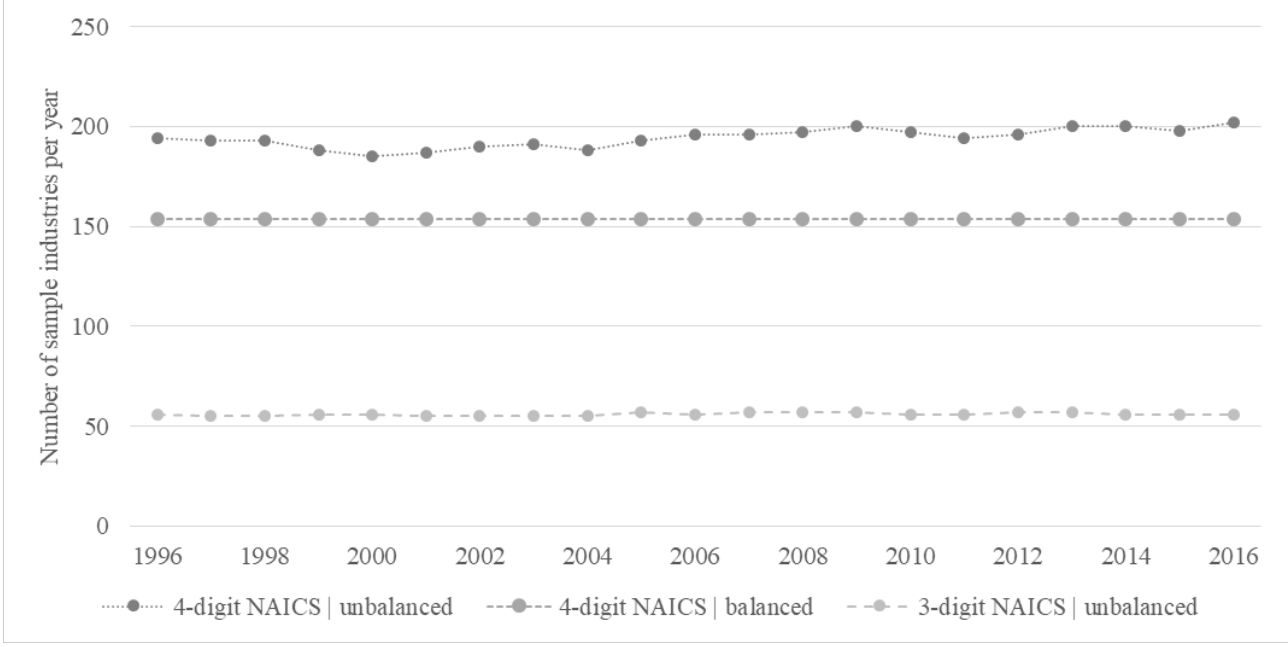
3. Figures and tables

Table A.1: Correlations between variables used in analysis

	PM	HHI	MHHIΔ (traditional)	MHHIΔ (equal share)	MHHIΔ (nc owner)	MHHIΔ (rescaled)	IS	C	DS	GC
PM	1.0000									
HHI	-0.0429	1.0000								
MHHIΔ (traditional)	0.1764	-0.6324	1.0000							
MHHIΔ (equal share)	0.1449	-0.3477	0.7948	1.0000						
MHHIΔ (nc owner)	0.0616	-0.3823	0.5502	0.5501	1.0000					
MHHIΔ (rescaled)	0.1901	-0.6466	0.9600	0.7565	0.6115	1.0000				
IS	0.2753	-0.2850	0.5184	0.2669	0.0435	0.5361	1.0000			
C	-0.0932	0.1753	-0.2841	-0.2473	-0.1103	-0.2933	-0.2992	1.0000		
DS	-0.0795	-0.0149	-0.0932	-0.1121	-0.0368	-0.0855	-0.1453	0.1137	1.0000	
GC	0.0611	-0.0026	-0.0415	-0.0757	0.0456	-0.0262	0.0024	0.1183	0.0571	1.0000

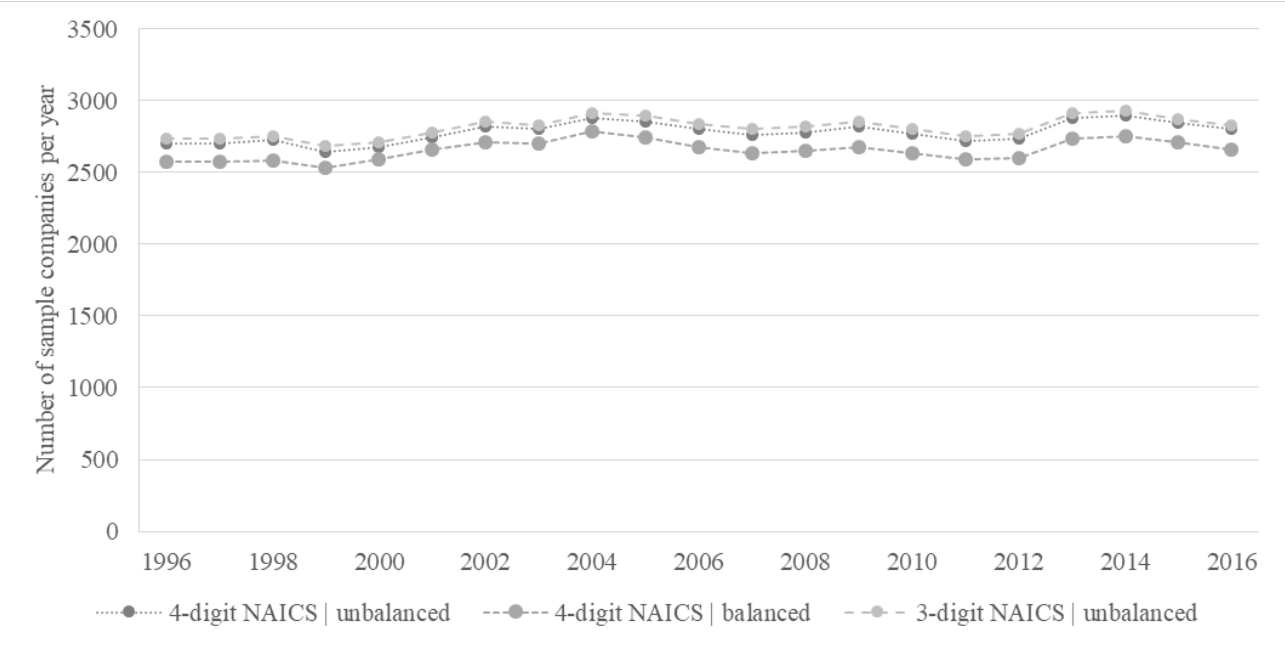
Correlations between the logged dependent and independent variables as used in the empirical analysis. Time period observed: 1996 to 2016.

Figure A.1: Number of industries covered over time



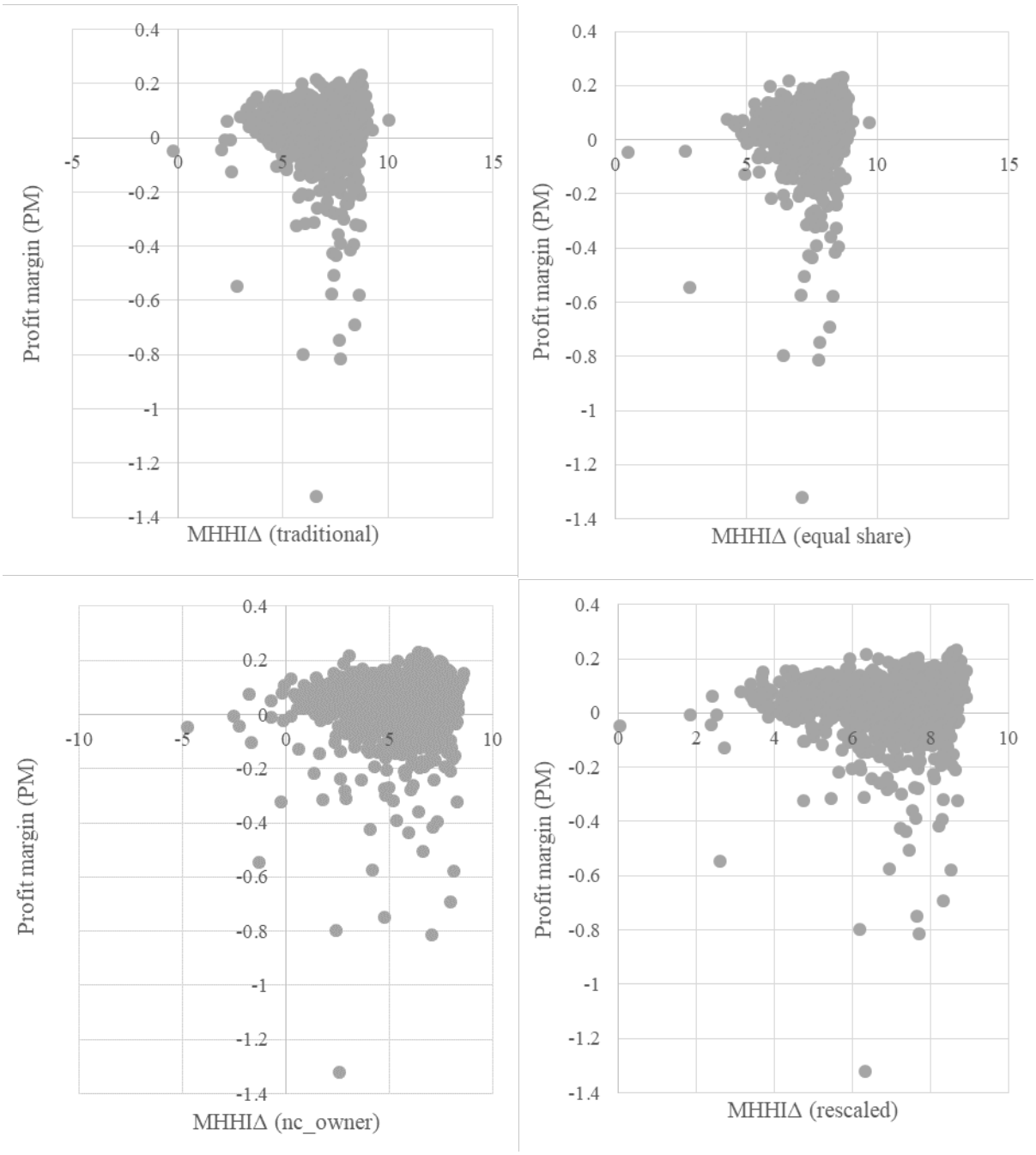
Number of industries covered by sample companies over time. Numbers vary as a result of the choice of the settings applied in model specifications used in our paper. Time period observed: 1996 to 2016.

Figure A.2: Number of companies covered over time



Number of companies included in our analyses over time. Numbers vary as a result of the choice of the settings applied in model specifications used in our paper. Time period observed: 1996 to 2016

Figure A.3: Scatter-plot: profit margin (y-axis) and MHHIΔ (x-axis)



Relationship between logged profit margins and all four versions of logged MHHIΔ. Time period observed: 1996 to 2016.

Additional regression results:

The following section contains detailed regression results for the models specified below.

Static models:

Abbr.	NAICS-level	Bal. / unbal. ?	Application of data filters?	Dep. variable winsorized?	# of lags (for instruments)	Treatment of instr. matrix	Min. share per 13F investor	13F reportings	Time period
A.S1	**4-digit**	**unbal.**	**yes**	**yes**	--	--	**0.0%**	**all**	**1996 - 2007**
A.S2	**4-digit**	**unbal.**	**yes**	**yes**	--	--	**0.0%**	**all**	**2008 - 2016**
A.S3	4-digit	bal.	yes	yes	--	--	0.0%	all	1996 - 2016
A.S4	4-digit	unbal.	yes	yes	--	--	0.5%	all	1996 - 2016
A.S5	4-digit	unbal.	yes	yes	--	--	0.0%	sole	1996 - 2016
A.S6	3-digit	unbal.	yes	yes	--	--	0.0%	all	1996 - 2016
A.S7	4-digit	unbal.	yes	yes	--	--	0.0%	all	2002 - 2016
A.S8	4-digit	unbal.	yes	no	--	--	0.0%	all	1996 - 2016
A.S9	4-digit	unbal.	no	no	--	--	0.0%	all	1996 - 2016

Dynamic models:

Abbr.	NAICS-level	Bal. / unbal. ?	Application of data filters?	Dep. variable winsorized?	# of lags (for instruments)	Treatment of instr. matrix	Min. share per 13F investor	13F reportings	Time period
A.D1	**4-digit**	**unbal.**	**yes**	**yes**	**2**	--	**0.0%**	**all**	**1996 - 2007**
A.D2	**4-digit**	**unbal.**	**yes**	**yes**	**2**	--	**0.0%**	**all**	**2008 - 2016**
A.D3	4-digit	bal.	yes	yes	2	--	0.0%	all	1996 - 2016
A.D4	4-digit	unbal.	yes	yes	2	--	0.5%	all	1996 - 2016
A.D5	4-digit	unbal.	yes	yes	2	--	0.0%	sole	1996 - 2016
A.D6	3-digit	unbal.	yes	yes	2	col.	0.0%	all	1996 - 2016
A.D7	4-digit	unbal.	yes	yes	2	--	0.0%	all	2002 - 2016
A.D8	4-digit	unbal.	yes	no	2	--	0.0%	all	1996 - 2016
A.D9	4-digit	unbal.	no	no	2	--	0.0%	all	1996 - 2016
A.D10	4-digit	unbal.	yes	yes	3	--	0.0%	all	1996 - 2016

Table AS.1: Regression results – dependent variable: profit margin [4-digit NAICS | 1996-2007 | unbalanced | static panel]

4-digit NAICS | **1996-2007** | unbalanced | static panel												
	MHHIΔ (traditional)			MHHIΔ (equal share)			MHHIΔ (nc owner)			MHHIΔ (rescaled)		
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
HHI	0.0010	0.0040	-0.0036	-0.0039	0.0003	-0.0013	0.0044	0.0062	-0.0012	0.0035	0.0056	-0.0027
	(0.0087)	(0.009)	(0.0114)	(0.0072)	(0.0077)	(0.0114)	(0.0074)	(0.0077)	(0.0111)	(0.0086)	(0.0088)	(0.0115)
MHHIΔ (traditional)	0.0075	0.0052	-0.0042									
	(0.006)	(0.0059)	(0.0048)									
MHHIΔ (equal share)				0.0046	0.0013	-0.0057						
				(0.0065)	(0.0067)	(0.0053)						
MHHIΔ (nc owner)							0.011***	0.0086**	-0.0011			
							(0.0042)	(0.0043)	(0.0041)			
MHHIΔ (rescaled)										0.0139*	0.0064	0.0066
										(0.0063)	(0.0049)	(0.0073)
IS		0.0165***	0.0235****		0.0172***	0.0237****		0.0139**	0.0234****		0.0158***	0.0235****
		(0.0057)	(0.0057)		(0.0057)	(0.0057)		(0.0059)	(0.0056)		(0.0058)	(0.0057)
C		-0.164****	-0.1477**		-0.1617****	-0.149**		-0.1654****	-0.1488**		-0.1647****	-0.1483**
		(0.0389)	(0.0713)		(0.0384)	(0.0712)		(0.038)	(0.0715)		(0.0386)	(0.0716)
DS			0.0128			0.0128			0.0125			0.0127
			(0.0167)			(0.0167)			(0.0166)			(0.0166)
GC			0.0057			0.0064			0.0053			0.0056
			(0.0064)			(0.0066)			(0.0064)			(0.0063)
Const.	-0.0134	-0.0198	0.1203	0.0463	0.0393	0.1143	-0.0366	-0.0449	0.0759	-0.0578	-0.0541	0.1037
	(0.1021)	(0.1051)	(0.1034)	(0.0877)	(0.0926)	(0.1058)	(0.069)	(0.0735)	(0.0909)	(0.1025)	(0.1061)	(0.1047)
R^2	0.0508	0.0603	0.0657	0.0488	0.0602	0.0657	0.0444	0.0632	0.0656	0.0551	0.0612	0.0653
# of industry-year observations	2294	2294	1145	2294	2294	1145	2294	2294	1145	2294	2294	1145

Regression results according to equation (7) and derived models M1 to M12. *,**,***,**** indicate statistical significance at the 0.1, 0.05, 0.01, and 0.001 level, respectively. Standard errors are provided in parentheses.

Table AS.2: Regression results – dependent variable: profit margin [4-digit NAICS | 2008-2016 | unbalanced | static panel]

4-digit NAICS | **2008-2016** | unbalanced | static panel												
	MHHIΔ (traditional)			MHHIΔ (equal share)			MHHIΔ (nc owner)			MHHIΔ (rescaled)		
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
HHI	0.0053	0.0182	0.0179	-0.0030	0.0133	0.0129	0.0066	0.0147	0.0143	0.0058	0.0168	0.0165
	(0.0219)	(0.0201)	(0.0205)	(0.0196)	(0.0179)	(0.0182)	(0.0199)	(0.0183)	(0.0186)	(0.0218)	(0.0202)	(0.0206)
MHHIΔ (traditional)	0.0139*	0.0064	0.0066									
	(0.0073)	(0.0066)	(0.0069)									
MHHIΔ (equal share)				0.0100	-0.0053	-0.0054						
				(0.0081)	(0.0076)	(0.0078)						
MHHIΔ (nc owner)							0.0125**	0.0010	0.0010			
							(0.0049)	(0.0043)	(0.0044)			
MHHIΔ (rescaled)										0.0304*	0.0209	-0.0061
										(0.0068)	(0.0071)	(0.0166)
IS		0.0534****	0.053****		0.0549****	0.0548****		0.0539****	0.0536****		0.0535****	0.0532****
		(0.0079)	(0.0072)		(0.0079)	(0.0072)		(0.0079)	(0.0072)		(0.0079)	(0.0072)
C		-0.1865*	-0.1882*		-0.1853*	-0.187*		-0.1842*	-0.1858*		-0.1859*	-0.1876*
		(0.1005)	(0.1009)		(0.0988)	(0.0992)		(0.0991)	(0.0995)		(0.1005)	(0.1008)
DS			-0.0059			-0.0062			-0.0057			-0.0057
			(0.0232)			(0.023)			(0.0231)			(0.0232)
GC			0.0011			-0.0001			0.0004			0.0008
			(0.0132)			(0.013)			(0.0131)			(0.0132)
Const.	-0.1324	-0.0975	-0.0995	-0.0386	0.0344	0.0355	-0.1182	-0.0266	-0.0263	-0.1423	-0.0709	-0.0720
	(0.2124)	(0.1986)	(0.2027)	(0.1789)	(0.1655)	(0.1672)	(0.1705)	(0.1577)	(0.1597)	(0.2127)	(0.2011)	(0.2052)
R^2	0.0477	0.0988	0.0984	0.0493	0.0998	0.0988	0.0266	0.0993	0.0985	0.0485	0.0990	0.0984
# of industry-year observations	1784	1784	1783	1784	1784	1783	1784	1784	1783	1784	1784	1783

Regression results according to equation (7) and derived models M1 to M12. *,**,***,**** indicate statistical significance at the 0.1, 0.05, 0.01, and 0.001 level, respectively. Standard errors are provided in parentheses.

Table AS.3: Regression results - dependent variable: profit margin [4-digit NAICS | 1996-2016 | balanced | static panel]

4-digit NAICS | 1996-2016 | **balanced** | static panel												
	MHHIΔ (traditional)			MHHIΔ (equal share)			MHHIΔ (nc owner)			MHHIΔ (rescaled)		
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
HHI	0.0134	0.0150	0.0141	0.0079	0.0124	0.0125	0.0121	0.0143	0.0146	0.0153	0.0165	0.0155
	(0.0117)	(0.0115)	(0.0154)	(0.0106)	(0.0106)	(0.0143)	(0.0113)	(0.0111)	(0.0149)	(0.0119)	(0.0117)	(0.0157)
MHHIΔ (traditional)	0.0111**	0.0051	0.0036									
	(0.0046)	(0.004)	(0.0058)									
MHHIΔ (equal share)				0.0095**	0.0028	0.0044						
				(0.0044)	(0.0036)	(0.0058)						
MHHIΔ (nc owner)							0.0082***	0.0036	0.0042			
							(0.003)	(0.0029)	(0.0052)			
MHHIΔ (rescaled)										0.0075*	0.0045	-0.0022
										(0.0045)	(0.0065)	(0.004)
IS		0.0253****	0.0399****		0.0259****	0.0399****		0.0252****	0.0397****		0.0247****	0.0395****
		(0.0038)	(0.0055)		(0.0038)	(0.0055)		(0.0038)	(0.0054)		(0.0038)	(0.0054)
C		-0.0891*	-0.0983*		-0.0874*	-0.098*		-0.0867*	-0.095*		-0.0902*	-0.0989*
		(0.0518)	(0.0539)		(0.0524)	(0.0543)		(0.0522)	(0.0541)		(0.0516)	(0.0539)
DS			0.0247			0.0249			0.0237			0.0239
			(0.0187)			(0.0187)			(0.0191)			(0.0186)
GC			0.0004			0.0005			0.0010			0.0004
			(0.01)			(0.0101)			(0.0103)			(0.0101)
Const.	-0.1370	-0.0824	-0.0524	-0.0823	-0.0436	-0.0455	-0.0840	-0.0562	-0.0525	-0.1773	-0.1184	-0.0856
	(0.1149)	(0.103)	(0.1348)	(0.1005)	(0.0897)	(0.1137)	(0.0959)	(0.089)	(0.117)	(0.1197)	(0.1093)	(0.1423)
R^2	0.0597	0.0879	0.0880	0.0539	0.0875	0.0875	0.0393	0.0885	0.0882	0.0658	0.0887	0.0882
# of industry-year observations	3234	3234	2309	3234	3234	2309	3234	3234	2309	3234	3234	2309

Regression results according to equation (7) and derived models M1 to M12. *,**,***,**** indicate statistical significance at the 0.1, 0.05, 0.01, and 0.001 level, respectively. Standard errors are provided in parentheses.

Table AS.4: Regression results - dependent variable: profit margin [4-digit NAICS | 1996-2016 | unbalanced | min. 13F share = 0.5% | static panel]

4-digit NAICS | 1996-2016 | unbalanced | **min. 13F share = 0.5%** | static panel												
	MHHIΔ (traditional)			MHHIΔ (equal share)			MHHIΔ (nc owner)			MHHIΔ (rescaled)		
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
HHI	0.0067	0.0108	0.0105	0.0031	0.0092	0.0086	0.0047	0.0094	0.0059	0.0076	0.0110	0.0099
	(0.0104)	(0.0102)	(0.0126)	(0.0095)	(0.0094)	(0.0116)	(0.0098)	(0.0096)	(0.012)	(0.0104)	(0.0101)	(0.0127)
MHHIΔ (traditional)	0.0054*	0.0012	0.0024									
	(0.0033)	(0.003)	(0.0037)									
MHHIΔ (equal share)				0.0029	-0.0037	-0.0015						
				(0.0037)	(0.0033)	(0.0038)						
MHHIΔ (nc owner)							0.0024	-0.0005	-0.0033			
							(0.0021)	(0.0021)	(0.0026)			
MHHIΔ (rescaled)										0.0043	0.0020	0.0002
										(0.003)	(0.0039)	(0.0037)
IS		0.0247****	0.0344****		0.0254****	0.0348****		0.025****	0.0349****		0.0246****	0.0344****
		(0.0037)	(0.0046)		(0.0036)	(0.0046)		(0.0036)	(0.0045)		(0.0037)	(0.0046)
C		-0.0618	-0.0772*		-0.0611	-0.076*		-0.0612	-0.0768*		-0.0620	-0.0769*
		(0.0455)	(0.0453)		(0.0459)	(0.0456)		(0.0457)	(0.046)		(0.0454)	(0.0453)
DS			0.0179			0.0184			0.0193			0.0181
			(0.0143)			(0.0146)			(0.0145)			(0.0144)
GC			0.0022			0.0022			0.0020			0.0022
			(0.007)			(0.007)			(0.0071)			(0.007)
Const.	-0.0408	-0.0055	-0.0056	0.0059	0.0439	0.0402	0.0039	0.0166	0.0667	-0.0559	-0.0110	0.0055
	(0.0992)	(0.0927)	(0.1105)	(0.0918)	(0.0859)	(0.0954)	(0.0821)	(0.0763)	(0.0932)	(0.0984)	(0.0916)	(0.1125)
R^2	0.0427	0.0958	0.1042	0.0401	0.0966	0.1052	0.0330	0.0960	0.1056	0.0445	0.0958	0.1045
# of industry-year observations	4069	4069	2925	4069	4069	2925	4069	4069	2925	4069	4069	2925

Regression results according to equation (7) and derived models M1 to M12. *,**,***,**** indicate statistical significance at the 0.1, 0.05, 0.01, and 0.001 level, respectively. Standard errors are provided in parentheses.

Table AS.5: Regression results - dependent variable: profit margin [4-digit NAICS | 1996-2016 | unbalanced | sole | static panel]

4-digit NAICS | 2008-2016 | unbalanced | **sole** | static panel												
	MHHIΔ (traditional)			MHHIΔ (equal share)			MHHIΔ (nc owner)			MHHIΔ (rescaled)		
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
HHI	0.0111	0.0171	0.0122	0.0063	0.0134	0.0098	0.0130	0.0192*	0.0113	0.0136	0.0186	0.0122
	(0.0141)	(0.0133)	(0.0136)	(0.013)	(0.0123)	(0.0124)	(0.0126)	(0.0119)	(0.0123)	(0.014)	(0.0131)	(0.0136)
MHHIΔ (traditional)	0.0055	0.0025	0.0020									
	(0.0039)	(0.0037)	(0.0042)									
MHHIΔ (equal share)				-0.0024	-0.0089*	-0.0059						
				(0.0053)	(0.005)	(0.0048)						
MHHIΔ (nc owner)							0.0073**	0.0050	0.0007			
							(0.0033)	(0.0035)	(0.003)			
MHHIΔ (rescaled)										0.0065*	0.0039	-0.0008
										(0.0039)	(0.0042)	(0.0038)
IS		0.0306****	0.0352****		0.0317****	0.0357****		0.0304****	0.0352****		0.0303****	0.0351****
		(0.0046)	(0.0047)		(0.0046)	(0.0048)		(0.0047)	(0.0047)		(0.0047)	(0.0047)
C		-0.0626	-0.0749		-0.0608	-0.0731		-0.0601	-0.0737		-0.0634	-0.0749
		(0.0553)	(0.048)		(0.0559)	(0.0484)		(0.055)	(0.0481)		(0.055)	(0.0481)
DS			0.0170			0.0175			0.0171			0.0170
			(0.015)			(0.0153)			(0.0152)			(0.0151)
GC			0.0034			0.0038			0.0034			0.0034
			(0.0074)			(0.0073)			(0.0074)			(0.0074)
Const.	-0.0851	-0.0500	-0.0148	0.0113	0.0667	0.0669	-0.0864	-0.0670	0.0049	-0.1292	-0.0786	-0.0147
	(0.1331)	(0.12)	(0.1212)	(0.1285)	(0.1184)	(0.1061)	(0.1042)	(0.0933)	(0.092)	(0.1325)	(0.1192)	(0.1206)
R^2	0.0365	0.0888	0.0975	0.0295	0.0906	0.0996	0.0274	0.0905	0.0979	0.0403	0.0889	0.0975
# of industry-year observations	3494	3494	2925	3494	3494	2925	3494	3494	2925	3494	3494	2925

Regression results according to equation (7) and derived models M1 to M12. *,**,***,**** indicate statistical significance at the 0.1, 0.05, 0.01, and 0.001 level, respectively. Standard errors are provided in parentheses.

Table AS.6: Regression results - dependent variable: profit margin [3-digit NAICS | 1996-2016 | unbalanced | static panel]

3-digit NAICS | 1996-2016 | unbalanced | static panel												
	MHHIΔ (traditional)			MHHIΔ (equal share)			MHHIΔ (nc owner)			MHHIΔ (rescaled)		
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
HHI	0.0126	0.0143	0.0208	0.0115	0.0148	0.0208	0.0160	0.0177	0.0263	0.0114	0.0148	0.0208
	(0.0166)	(0.0162)	(0.0243)	(0.0157)	(0.0155)	(0.0233)	(0.016)	(0.0158)	(0.024)	(0.0156)	(0.0154)	(0.0232)
MHHIΔ (traditional)	0.0048	-0.0019	0.0001									
	(0.0056)	(0.0044)	(0.0068)									
MHHIΔ (equal share)				0.0065	-0.0006	-0.0033						
				(0.0068)	(0.0058)	(0.008)						
MHHIΔ (nc owner)							0.0096*	0.0062	0.0136*			
							(0.0053)	(0.0046)	(0.0081)			
MHHIΔ (rescaled)										0.0020	-0.0054	-0.0055
										(0.0014)	(0.002)	(0.0096)
IS		0.0311****	0.0341****		0.0308****	0.0344****		0.0301****	0.0336****		0.0308****	0.0341****
		(0.0072)	(0.0089)		(0.0072)	(0.0088)		(0.0072)	(0.0086)		(0.0074)	(0.009)
C		-0.0403	-0.0787		-0.0405	-0.0786		-0.0379	-0.0697		-0.0405	-0.0785
		(0.0597)	(0.0619)		(0.0595)	(0.0616)		(0.0585)	(0.0578)		(0.0603)	(0.0622)
DS			-0.0074			-0.0072			-0.0098			-0.0073
			(0.0148)			(0.0145)			(0.0158)			(0.0148)
GC			0.0236			0.0237			0.0259			0.0235
			(0.021)			(0.0209)			(0.0207)			(0.0209)
Const.	-0.0699	-0.0258	-0.0208	-0.0740	-0.0398	-0.0186	-0.1057	-0.0960	-0.042*	-0.0191	-0.0411	-0.0206
	(0.1558)	(0.1301)	(0.0149)	(0.1566)	(0.1324)	(0.0154)	(0.1255)	(0.1106)	(0.0217)	(0.1177)	(0.1062)	(0.0144)
R^2	0.0404	0.1101	0.1053	0.0381	0.1093	0.1059	0.0209	0.1044	0.0949	0.0344	0.1096	0.1057
# of industry-year observations	1176	1176	925	1176	1176	925	1176	1176	925	1176	1176	925

Regression results according to equation (7) and derived models M1 to M12. *,**,***,**** indicate statistical significance at the 0.1, 0.05, 0.01, and 0.001 level, respectively. Standard errors are provided in parentheses.

Table AS.7: Regression results - dependent variable: profit margin [4-digit NAICS | 2002-2016 | unbalanced | static panel]

4-digit NAICS | **2002-2016** | unbalanced | static panel												
	MHHIΔ (traditional)			MHHIΔ (equal share)			MHHIΔ (nc owner)			MHHIΔ (rescaled)		
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
HHI	0.0038	0.0097	0.0108	0.0015	0.0082	0.0097	0.0062	0.0096	0.0108	0.0051	0.0097	0.0109
	(0.0134)	(0.0127)	(0.0129)	(0.0121)	(0.0115)	(0.0117)	(0.0124)	(0.012)	(0.0121)	(0.0134)	(0.0127)	(0.0129)
MHHIΔ (traditional)	0.0041	0.0013	0.0008									
	(0.0042)	(0.004)	(0.0039)									
MHHIΔ (equal share)				0.0043	-0.0037	-0.0043						
				(0.0043)	(0.0043)	(0.0043)						
MHHIΔ (nc owner)							0.0067**	0.0011	0.0008			
							(0.0029)	(0.0028)	(0.0029)			
MHHIΔ (rescaled)										-0.0027	-0.0032	-0.0042
										(0.0041)	(0.0041)	(0.0049)
IS		0.0343****	0.0347****		0.0348****	0.0353****		0.0341****	0.0346****		0.0342****	0.0346****
		(0.0046)	(0.0046)		(0.0047)	(0.0047)		(0.0046)	(0.0046)		(0.0047)	(0.0047)
C		-0.0729	-0.0739*		-0.0718	-0.0731		-0.0720	-0.0733*		-0.0729	-0.074*
		(0.0459)	(0.0452)		(0.0463)	(0.0456)		(0.0465)	(0.0457)		(0.0459)	(0.0452)
DS			0.0173			0.0177			0.0172			0.0173
			(0.0144)			(0.0146)			(0.0145)			(0.0144)
GC			0.0025			0.0028			0.0026			0.0025
			(0.0071)			(0.007)			(0.0071)			(0.0071)
Const.	-0.0324	0.0035	0.0055	-0.0160	0.0541	0.0549	-0.0588	0.0079	0.0066	-0.0554	0.0028	0.0034
	(0.1264)	(0.1132)	(0.1138)	(0.109)	(0.0981)	(0.0983)	(0.1049)	(0.0957)	(0.0965)	(0.1275)	(0.1152)	(0.1161)
R^2	0.0415	0.1046	0.1047	0.0422	0.1057	0.1059	0.0296	0.1047	0.1048	0.0436	0.1046	0.1047
# of industry-year observations	2938	2938	2928	2938	2938	2928	2938	2938	2928	2938	2938	2928

Regression results according to equation (7) and derived models M1 to M12. *,**,***,**** indicate statistical significance at the 0.1, 0.05, 0.01, and 0.001 level, respectively. Standard errors are provided in parentheses.

Table AS.8: Regression results - dependent variable: profit margin [4-digit NAICS | 1996-2016 | unbalanced | no winsorization | static panel]

4-digit NAICS | 2008-2016 | unbalanced | **no winsorization** | static panel												
	MHHIΔ (traditional)			MHHIΔ (equal share)			MHHIΔ (nc owner)			MHHIΔ (rescaled)		
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
HHI	0.0066	0.0115	0.0051	0.0039	0.0108	0.0048	0.0101	0.0133	0.0058	0.0085	0.0124	0.0048
	(0.0114)	(0.0115)	(0.013)	(0.0115)	(0.0115)	(0.0122)	(0.0119)	(0.0117)	(0.0122)	(0.0115)	(0.0115)	(0.013)
MHHIΔ (traditional)	0.0037	-0.0007	-0.0013									
	(0.0033)	(0.0031)	(0.0038)									
MHHIΔ (equal share)				0.0011	-0.0067**	-0.0091*						
				(0.0036)	(0.0034)	(0.0055)						
MHHIΔ (nc owner)							0.0073***	0.0017	-0.0003			
							(0.0024)	(0.0023)	(0.0035)			
MHHIΔ (rescaled)										0.0053	0.0031	-0.0043
										(0.0034)	(0.0041)	(0.0034)
IS		0.0264****	0.0356****		0.0273****	0.0365****		0.0258****	0.0355****		0.0263****	0.0357****
		(0.0044)	(0.0052)		(0.0044)	(0.0053)		(0.0042)	(0.0053)		(0.0044)	(0.0053)
C		-0.1418*	-0.1094*		-0.1415*	-0.109*		-0.1422*	-0.11*		-0.1423*	-0.1092*
		(0.0738)	(0.0635)		(0.0744)	(0.0634)		(0.0742)	(0.0637)		(0.0738)	(0.0635)
DS			0.0192			0.0196			0.0191			0.0193
			(0.0153)			(0.0155)			(0.0155)			(0.0153)
GC			0.0065			0.0069			0.0065			0.0065
			(0.0088)			(0.0088)			(0.0089)			(0.0088)
Const.	-0.0302	-0.0114	0.0525	0.0096	0.0402	0.1171	-0.0651	-0.0395	0.0389	-0.0634	-0.0272	0.0585
	(0.097)	(0.0972)	(0.1103)	(0.1009)	(0.0991)	(0.1065)	(0.0985)	(0.0978)	(0.0954)	(0.0992)	(0.0987)	(0.1118)
R^2	0.0378	0.0491	0.0739	0.0364	0.0495	0.0751	0.0353	0.0494	0.0738	0.0397	0.0491	0.0740
# of industry-year observations	4069	4069	2926	4069	4069	2926	4069	4069	2926	4069	4069	2926

Regression results according to equation (7) and derived models M1 to M12. *,**,***,**** indicate statistical significance at the 0.1, 0.05, 0.01, and 0.001 level, respectively. Standard errors are provided in parentheses.

Table AS.9: Regression results - dependent variable: profit margin [4-digit NAICS | 1996-2016 | unbalanced | no winsorization | no filters | static panel]

4-digit NAICS | 2008-2016 | unbalanced | **no winsorization** | **no filters** | static panel												
	MHHIΔ (traditional)			MHHIΔ (equal share)			MHHIΔ (nc owner)			MHHIΔ (rescaled)		
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
HHI	0.0043	0.0109	0.0058	0.0033	0.0110	0.0059	0.0106	0.0142	0.0075	0.0082	0.0123	0.0056
	(0.0115)	(0.0116)	(0.0127)	(0.0114)	(0.0115)	(0.0121)	(0.0118)	(0.0116)	(0.0122)	(0.0116)	(0.0116)	(0.013)
MHHIΔ (traditional)	0.0009	-0.0014	-0.0010									
	(0.0028)	(0.0026)	(0.0028)									
MHHIΔ (equal share)				-0.0011	-0.0046*	-0.0045						
				(0.0028)	(0.0026)	(0.003)						
MHHIΔ (nc owner)							0.008****	0.0030	0.0012			
							(0.0022)	(0.002)	(0.0029)			
MHHIΔ (rescaled)										0.0040	0.0020	-0.0045
										(0.0034)	(0.0038)	(0.0033)
IS		0.0269****	0.0358****		0.0272****	0.036****		0.0256****	0.0354****		0.0266****	0.0359****
		(0.0043)	(0.0051)		(0.0042)	(0.0051)		(0.0042)	(0.0052)		(0.0043)	(0.0052)
C		-0.14*	-0.1098*		-0.1409*	-0.1105*		-0.1409*	-0.11*		-0.1408*	-0.1097*
		(0.074)	(0.0636)		(0.0742)	(0.0636)		(0.074)	(0.0636)		(0.0738)	(0.0637)
DS			0.0189			0.0185			0.0185			0.0190
			(0.0154)			(0.0154)			(0.0154)			(0.0154)
GC			0.0064			0.0066			0.0065			0.0064
			(0.0088)			(0.0088)			(0.0089)			(0.0088)
Const.	0.0078	-0.0007	0.0444	0.0301	0.0231	0.0716	-0.0722	-0.0539	0.0163	-0.0600	-0.0268	0.0497
	(0.0973)	(0.0986)	(0.102)	(0.0981)	(0.0978)	(0.0913)	(0.0975)	(0.0966)	(0.0928)	(0.1016)	(0.1013)	(0.1118)
R^2	0.0358	0.0499	0.0747	0.0343	0.0502	0.0753	0.0366	0.0507	0.0746	0.0393	0.0498	0.0747
# of industry-year observations	4072	4072	2926	4072	4072	2926	4072	4072	2926	4072	4072	2926

Regression results according to equation (7) and derived models M1 to M12. *,**,***,**** indicate statistical significance at the 0.1, 0.05, 0.01, and 0.001 level, respectively. Standard errors are provided in parentheses.

Table AD.1: Regression results - dependent variable: profit margin [4-digit NAICS | 1996-2007 | unbalanced | dynamic panel (2 lags | 2-step)]

4-digit NAICS | **1996-2007** | unbalanced | dynamic panel (2 lags | 2-step)												
	MHHIΔ (traditional)			MHHIΔ (equal share)			MHHIΔ (nc owner)			MHHIΔ (rescaled)		
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
PM (t-1)	0.3601****	0.3132****	0.2682****	0.3351****	0.2968****	0.2607****	0.3331****	0.2859****	0.2696****	0.3451****	0.3034****	0.2799****
	(0.0784)	(0.0698)	(0.0735)	(0.0744)	(0.0635)	(0.0719)	(0.0673)	(0.0633)	(0.0746)	(0.077)	(0.0668)	(0.0769)
HHI	0.0187	0.0196	-0.0235	0.0083	0.0123	-0.0219	0.0321	0.0203	-0.0143	0.0202	0.0162	-0.0188
	(0.0196)	(0.0217)	(0.0304)	(0.021)	(0.0227)	(0.0324)	(0.0222)	(0.0237)	(0.0296)	(0.0183)	(0.0224)	(0.0302)
MHHIΔ (traditional)	0.0107	0.0115	-0.0044									
	(0.0083)	(0.0088)	(0.0059)									
MHHIΔ (equal share)				0.0052	0.0037	-0.0047						
				(0.0092)	(0.0097)	(0.0052)						
MHHIΔ (nc owner)							0.0071	0.0100	-0.0046			
							(0.0055)	(0.0074)	(0.0044)			
MHHIΔ (rescaled)										0.0121	0.0133	-0.0025
										(0.0083)	(0.0094)	(0.0073)
IS		0.0191**	0.0130		0.0173**	0.0143		0.0072	0.0109		0.0168**	0.0128
		(0.0078)	(0.0091)		(0.0076)	(0.0095)		(0.0085)	(0.008)		(0.0077)	(0.0084)
C		-0.1422*	0.0908		-0.141*	0.0560		-0.1517	0.0608		-0.1442*	0.0749
		(0.0759)	(0.0948)		(0.0803)	(0.1106)		(0.1019)	(0.103)		(0.0751)	(0.0908)
DS			-0.0022			0.0002			0.0004			0.0033
			(0.0357)			(0.0307)			(0.034)			(0.0343)
GC			0.0102			0.0055			0.0098			0.0173
			(0.0173)			(0.0167)			(0.0172)			(0.0157)
AB 2 (p)	0.4660	0.4000	0.6160	0.3990	0.3430	0.6450	0.3770	0.2990	0.5280	0.4450	0.3870	0.5880
Hansen (p)	0.2880	0.2680	0.1790	0.2200	0.3450	0.2090	0.0550	0.0280	0.1350	0.2640	0.2110	0.1390
# of industry-year observations	1814	1814	903	1814	1814	903	1814	1814	903	1814	1814	903

Regression results according to equation (8) and derived models M1 to M12. *,**,***,**** indicate statistical significance at the 0.1, 0.05, 0.01, and 0.001 level, respectively. Standard errors are provided in parentheses.

Table AD.2: Regression results - dependent variable: profit margin [4-digit NAICS | 2008-2016 | unbalanced | dynamic panel (2 lags | 2-step)]

4-digit NAICS | **2008-2016** | unbalanced | dynamic panel (2 lags | 2-step)												
	MHHIΔ (traditional)			MHHIΔ (equal share)			MHHIΔ (nc owner)			MHHIΔ (rescaled)		
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
PM (t-1)	0.172****	0.121**	0.1133**	0.1758****	0.1383**	0.1242**	0.1515***	0.1311**	0.1172**	0.1633****	0.1234**	0.1167**
	(0.0517)	(0.0597)	(0.0533)	(0.05)	(0.067)	(0.0553)	(0.05)	(0.0628)	(0.0596)	(0.0471)	(0.0615)	(0.055)
HHI	-0.0045	0.0496	0.0408	0.0046	0.0519	0.0384	-0.0437	0.0307	0.0306	-0.0235	0.0444	0.0360
	(0.0369)	(0.0347)	(0.0351)	(0.0324)	(0.0341)	(0.0326)	(0.0378)	(0.0316)	(0.0369)	(0.0302)	(0.0353)	(0.0354)
MHHIΔ (traditional)	0.0116	-0.0069	-0.0056									
	(0.0111)	(0.0099)	(0.0084)									
MHHIΔ (equal share)				-0.0092	-0.0349***	-0.0297***						
				(0.011)	(0.0122)	(0.0108)						
MHHIΔ (nc owner)							0.0049	-0.0108	-0.0092			
							(0.0048)	(0.0139)	(0.008)			
MHHIΔ (rescaled)										0.0101	-0.0085	-0.0066
										(0.0096)	(0.0106)	(0.0096)
IS		0.0876**	0.089***		0.1076***	0.1009***		0.1007**	0.0959***		0.0924**	0.0937***
		(0.0366)	(0.0323)		(0.0389)	(0.0361)		(0.0429)	(0.0362)		(0.0373)	(0.0325)
C		-0.2957	-0.3446**		-0.1541	-0.2741*		-0.1855	-0.2599		-0.2925	-0.33**
		(0.1963)	(0.1685)		(0.1946)	(0.1565)		(0.2277)	(0.1858)		(0.1909)	(0.1636)
DS			-0.0065			0.0000			-0.0033			-0.0075
			(0.015)			(0.0175)			(0.0163)			(0.014)
GC			-0.0123			-0.0077			-0.0023			-0.0114
			(0.0269)			(0.0268)			(0.0238)			(0.0264)
AB 2 (p)	0.2530	0.2620	0.2560	0.3100	0.2110	0.2180	0.1830	0.1750	0.1970	0.2160	0.2250	0.2170
Hansen (p)	0.2230	0.1610	0.1200	0.2500	0.1350	0.2000	0.3670	0.1230	0.1840	0.4540	0.1900	0.1400
# of industry-year observations	1339	1339	1339	1339	1339	1339	1339	1339	1339	1339	1339	1339

Regression results according to equation (8) and derived models M1 to M12. *,**,***,**** indicate statistical significance at the 0.1, 0.05, 0.01, and 0.001 level, respectively. Standard errors are provided in parentheses.

Table AD.3: Regression results - dependent variable: profit margin [4-digit NAICS | 1996-2016 | balanced | Dynamic panel (2 lags | 2-step)]

4-digit NAICS | 1996-2016 | **balanced** | dynamic panel (2 lags | 2-step)												
	MHHIΔ (traditional)			MHHIΔ (equal share)			MHHIΔ (nc owner)			MHHIΔ (rescaled)		
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
PM (t-1)	0.313****	0.2692****	0.2277****	0.3151****	0.2763****	0.229****	0.3065****	0.2805****	0.2246****	0.307****	0.2704****	0.2262****
	(0.0816)	(0.0782)	(0.0662)	(0.0805)	(0.0794)	(0.0624)	(0.0764)	(0.0782)	(0.0635)	(0.0792)	(0.08)	(0.0667)
HHI	0.0065	0.0188	0.0031	0.0053	0.0163	0.0053	0.0104	0.0214	-0.0007	0.0070	0.0207	0.0035
	(0.0204)	(0.0242)	(0.0271)	(0.0194)	(0.0215)	(0.0292)	(0.0209)	(0.0248)	(0.0264)	(0.0197)	(0.0233)	(0.0272)
MHHIΔ (traditional)	0.0072	0.0047	0.0025									
	(0.0046)	(0.0053)	(0.0062)									
MHHIΔ (equal share)				0.0056	0.0009	0.0019						
				(0.0037)	(0.0046)	(0.0071)						
MHHIΔ (nc owner)							0.0067	0.0035	0.0001			
							(0.0049)	(0.0056)	(0.0064)			
MHHIΔ (rescaled)										0.0089	0.0068	0.0057
										(0.0056)	(0.0063)	(0.0076)
IS		0.0265***	0.0395****		0.0276***	0.0368***		0.0246***	0.0402****		0.0268***	0.0373***
		(0.0086)	(0.0116)		(0.0091)	(0.012)		(0.0096)	(0.0109)		(0.0087)	(0.0119)
C		-0.0663	0.0825		-0.0516	0.0847		-0.0349	0.0970		-0.0680	0.0653
		(0.0996)	(0.127)		(0.0998)	(0.1191)		(0.0992)	(0.1389)		(0.1065)	(0.1255)
DS			-0.0045			-0.0017			-0.0078			-0.0026
			(0.0242)			(0.0226)			(0.0275)			(0.0249)
GC			-0.0391*			-0.0391**			-0.0369*			-0.039*
			(0.0216)			(0.0196)			(0.0197)			(0.0216)
AB 2 (p)	0.3760	0.3120	0.9510	0.3770	0.3520	0.9590	0.3350	0.3370	0.9560	0.3540	0.3190	0.9870
Hansen (p)	0.3560	0.9950	0.9970	0.6650	0.9980	0.9970	0.2090	0.9970	0.9970	0.3650	0.9890	0.9980
# of industry-year observations	2926	2926	2155	2926	2926	2155	2926	2926	2155	2926	2926	2155

Regression results according to equation (8) and derived models M1 to M12. *,**,***,**** indicate statistical significance at the 0.1, 0.05, 0.01, and 0.001 level, respectively. Standard errors are provided in parentheses.

Table AD.4: Regression results - dependent variable: profit margin [4-digit NAICS | 1996-2016 | unbalanced | min. 13F share=0.5% | Dynamic panel (2 lags | 2-step)]

4-digit NAICS | 1996-2016 | unbalanced | **min. 13F share=0.5%** | dynamic panel (2 lags | 2-step)												
	MHHIΔ (traditional)			MHHIΔ (equal share)			MHHIΔ (nc owner)			MHHIΔ (rescaled)		
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
PM (t-1)	0.3154****	0.2747****	0.2375****	0.3122****	0.2755****	0.2383****	0.3093****	0.2767****	0.2366****	0.3143****	0.2737****	0.2375****
	(0.0551)	(0.0547)	(0.0551)	(0.0545)	(0.0539)	(0.0542)	(0.0511)	(0.0539)	(0.0556)	(0.0548)	(0.0539)	(0.0552)
HHI	0.0323**	0.0184	-0.0107	0.027*	0.0176	-0.0094	0.0318*	0.0161	-0.0159	0.0326**	0.0180	-0.0103
	(0.0156)	(0.0174)	(0.0193)	(0.015)	(0.016)	(0.0204)	(0.0168)	(0.0176)	(0.0199)	(0.0155)	(0.0179)	(0.0193)
MHHIΔ (traditional)	0.0042	0.0031	-0.0015									
	(0.0039)	(0.0039)	(0.0049)									
MHHIΔ (equal share)				-0.0020	-0.0013	-0.0020						
				(0.0047)	(0.0051)	(0.0052)						
MHHIΔ (nc owner)							0.0011	-0.0005	-0.0042			
							(0.0029)	(0.0034)	(0.0038)			
MHHIΔ (rescaled)										0.0042	0.0030	-0.0011
										(0.0041)	(0.0043)	(0.0053)
IS		0.0285***	0.0389****		0.0277***	0.0372***		0.0291***	0.0412****		0.0279***	0.0388****
		(0.0096)	(0.0112)		(0.0101)	(0.0116)		(0.0105)	(0.0125)		(0.0098)	(0.0114)
C		-0.0913	0.0433		-0.0669	0.0651		-0.0689	0.0586		-0.0883	0.0413
		(0.0796)	(0.1235)		(0.0818)	(0.1149)		(0.0825)	(0.1228)		(0.0796)	(0.1214)
DS			-0.0238			-0.0202			-0.0180			-0.0238
			(0.019)			(0.0166)			(0.0181)			(0.0183)
GC			-0.0322			-0.0305*			-0.0343*			-0.0317
			(0.0205)			(0.0182)			(0.019)			(0.0204)
AB 2 (p)	0.7440	0.7390	0.1730	0.7840	0.7500	0.1830	0.8090	0.7260	0.1500	0.7530	0.7480	0.1740
Hansen (p)	0.2800	0.3510	0.4580	0.2480	0.4790	0.4390	0.2760	0.3170	0.3350	0.2760	0.3300	0.4250
# of industry-year observations	3524	3524	2615	3524	3524	2615	3524	3524	2615	3524	3524	2615

Regression results according to equation (8) and derived models M1 to M12. *,**,***,**** indicate statistical significance at the 0.1, 0.05, 0.01, and 0.001 level, respectively. Standard errors are provided in parentheses.

Table AD.5: Regression results - dependent variable: profit margin [4-digit NAICS | 1996-2016 | unbalanced | sole | Dynamic panel (2 lags | 2-step)]

4-digit NAICS | 1996-2016 | unbalanced | **sole** | dynamic panel (2 lags | 2-step)												
	MHHIΔ (traditional)			MHHIΔ (equal share)			MHHIΔ (nc owner)			MHHIΔ (rescaled)		
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
PM (t-1)	0.2758****	0.2439****	0.2091****	0.2851****	0.2476****	0.2119****	0.2805****	0.2445****	0.2077****	0.2737****	0.2434****	0.2106****
	(0.0541)	(0.0527)	(0.0561)	(0.0575)	(0.054)	(0.0573)	(0.0535)	(0.0532)	(0.0553)	(0.0538)	(0.0516)	(0.056)
HHI	0.0576**	0.0265	-0.0134	0.0435**	0.0284	-0.0100	0.0662**	0.0308	-0.0130	0.0594**	0.0260	-0.0117
	(0.0242)	(0.0241)	(0.0198)	(0.0221)	(0.0229)	(0.0192)	(0.0259)	(0.024)	(0.0191)	(0.0235)	(0.024)	(0.0198)
MHHIΔ (traditional)	0.0019	0.0007	-0.0016									
	(0.0041)	(0.0044)	(0.0053)									
MHHIΔ (equal share)				-0.0039	-0.0036	-0.0009						
				(0.005)	(0.006)	(0.0064)						
MHHIΔ (nc owner)							0.0024	0.0004	-0.0001			
							(0.0031)	(0.0032)	(0.0037)			
MHHIΔ (rescaled)										0.0038	0.0024	0.0001
										(0.0044)	(0.0053)	(0.0056)
IS		0.0275**	0.0422****		0.0295**	0.0402***		0.03**	0.0408***		0.0287**	0.0435****
		(0.0119)	(0.0127)		(0.0121)	(0.0141)		(0.0117)	(0.0126)		(0.0126)	(0.013)
C		-0.0532	0.0507		-0.0431	0.0727		-0.0626	0.0390		-0.0622	0.0496
		(0.0953)	(0.1282)		(0.1009)	(0.1198)		(0.1062)	(0.1362)		(0.0964)	(0.1274)
DS			-0.0257			-0.0208			-0.0202			-0.0267
			(0.0187)			(0.0174)			(0.019)			(0.0189)
GC			-0.0338*			-0.0313*			-0.035*			-0.033*
			(0.0195)			(0.0181)			(0.019)			(0.0199)
AB 2 (p)	0.6390	0.5570	0.2260	0.5810	0.5520	0.2350	0.6960	0.5670	0.2270	0.6520	0.5370	0.2130
Hansen (p)	0.2260	0.1360	0.3130	0.2460	0.3100	0.5070	0.3630	0.2610	0.3590	0.1730	0.0840	0.3000
# of industry-year observations	2985	2985	2615	2985	2985	2615	2985	2985	2615	2985	2985	2615

Regression results according to equation (8) and derived models M1 to M12. *,**,***,**** indicate statistical significance at the 0.1, 0.05, 0.01, and 0.001 level, respectively. Standard errors are provided in parentheses.

Table AD.6: Regression results - dependent variable: profit margin [3-digit NAICS | 1996-2016 | unbalanced | Dynamic panel (2 lags | 2-step)]

3-digit NAICS | 1996-2016 | unbalanced | dynamic panel (2 lags | 2-step)												
	MHHIΔ (traditional)			MHHIΔ (equal share)			MHHIΔ (nc owner)			MHHIΔ (rescaled)		
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
PM (t-1)	0.2968****	0.3474****	0.312*	0.3301****	0.3608****	0.365**	0.2741****	0.38**	0.2626	0.3197****	0.4307**	0.3101*
	(0.0616)	(0.0982)	(0.1805)	(0.0656)	(0.1011)	(0.1619)	(0.0703)	(0.1534)	(0.2143)	(0.084)	(0.182)	(0.178)
HHI	-0.0716*	-0.0139	0.0919	-0.0698**	-0.0280	0.0223	-0.0632*	-0.0199	0.2034	-0.0629	-0.016	0.1794
	(0.0393)	(0.0397)	(0.1106)	(0.0335)	(0.0421)	(0.1041)	(0.033)	(0.0422)	(0.1671)	(0.0498)	(0.0576)	(0.135)
MHHIΔ	0.0228*	0.0206*	-0.0059									
	(0.0141)	(0.0115)	(0.0417)									
MHHIΔ (equal share)				0.05**	0.0293	-0.0361						
				(0.0204)	(0.0231)	(0.0639)						
MHHIΔ (nc owner)							0.0147	0.0024	0.0335			
							(0.0111)	(0.0116)	(0.0453)			
MHHIΔ (rescaled)										0.0017	0.0012	0.0015
										(0.0020)	(0.0016)	(0.0037)
IS		0.0615*	0.0830		0.0529*	0.0497		0.0716*	0.0185		0.0723	0.0236
		(0.0357)	(0.1222)		(0.0326)	(0.0961)		(0.0386)	(0.1177)		(0.051)	(0.089)
C		-0.3331*	-0.4682		-0.2658	-0.0268		-0.2458	-0.4351		-0.1114	-0.504
		(0.1783)	(0.5968)		(0.1836)	(0.6432)		(0.2856)	(0.6585)		(0.2403)	(0.473)
DS			-0.0121			-0.0321			-0.0151			-0.0193
			(0.0477)			(0.0414)			(0.0502)			(0.0397)
GC			0.2018			0.0761			0.3455			0.0754
			(0.1364)			(0.1303)			(0.296)			(0.1477)
AB 2 (p)	0.7470	0.6320	0.4600	0.9180	0.6110	0.5280	0.7400	0.5800	0.3330	0.7230	0.5970	0.4480
Hansen (p)	0.9430	0.1750	0.3890	0.8410	0.2290	0.3330	0.9380	0.1410	0.4870	0.8450	0.1890	0.4740
# of industry-year observations	1053	1053	862	1053	1053	862	1053	1053	862	1053	1053	862

Regression results according to equation (8) and derived models M1 to M12. *,**,***,**** indicate statistical significance at the 0.1, 0.05, 0.01, and 0.001 level, respectively. Standard errors are provided in parentheses.

Table AD.7: Regression results - dependent variable: profit margin [4-digit NAICS | 2002-2016 | unbalanced | Dynamic panel (2 lags | 2-step)]

4-digit NAICS | **2002-2016** | unbalanced | dynamic panel (2 lags | 2-step)												
	MHHIΔ (traditional)			MHHIΔ (equal share)			MHHIΔ (nc owner)			MHHIΔ (rescaled)		
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
PM (t-1)	0.2267****	0.2085****	0.1977****	0.2194****	0.2127****	0.1976****	0.2097****	0.2086****	0.1985****	0.2313****	0.2088****	0.1973****
	(0.056)	(0.0568)	(0.0561)	(0.0535)	(0.0552)	(0.0569)	(0.051)	(0.0577)	(0.0589)	(0.0552)	(0.0562)	(0.0555)
HHI	0.0285	0.0160	0.0032	0.0267	0.0273*	0.0070	0.0312	0.0125	-0.0014	0.0298	0.0158	0.0028
	(0.0214)	(0.0142)	(0.0159)	(0.0196)	(0.0165)	(0.0174)	(0.0199)	(0.0144)	(0.0167)	(0.0222)	(0.014)	(0.0165)
MHHIΔ (traditional)	-0.0025	-0.0053	-0.0038									
	(0.0048)	(0.0044)	(0.005)									
MHHIΔ (equal share)				-0.0067	-0.0087*	-0.0054						
				(0.0049)	(0.0052)	(0.0054)						
MHHIΔ (nc owner)							-0.0041	-0.0032	-0.0029			
							(0.0031)	(0.0039)	(0.0041)			
MHHIΔ (rescaled)										-0.0027	-0.0057	-0.0044
										(0.005)	(0.0047)	(0.0056)
IS		0.0414***	0.0408***		0.042***	0.0416***		0.0433**	0.0422***		0.0416***	0.0406***
		(0.016)	(0.0138)		(0.016)	(0.0133)		(0.0169)	(0.0145)		(0.0158)	(0.0137)
C		0.0427	0.1007		0.0361	0.1083		0.0455	0.0913		0.0383	0.0921
		(0.112)	(0.1097)		(0.0992)	(0.107)		(0.1058)	(0.1143)		(0.1115)	(0.1072)
DS			-0.0195			-0.0188			-0.0195			-0.0201
			(0.0188)			(0.0186)			(0.0178)			(0.0192)
GC			-0.0280			-0.0275*			-0.0223			-0.0265
			(0.0185)			(0.0165)			(0.0166)			(0.0183)
AB 2 (p)	0.6530	0.4210	0.4070	0.6970	0.4350	0.4210	0.7550	0.3960	0.3810	0.6360	0.4110	0.4040
Hansen (p)	0.1130	0.0840	0.2680	0.1690	0.2680	0.3550	0.2360	0.0960	0.2390	0.1340	0.0930	0.2730
# of industry-year observations	2450	2450	2443	2450	2450	2443	2450	2450	2443	2450	2450	2443

Regression results according to equation (8) and derived models M1 to M12. *,**,***,**** indicate statistical significance at the 0.1, 0.05, 0.01, and 0.001 level, respectively. Standard errors are provided in parentheses.

Table AD.8: Regression results - dependent variable: profit margin [4-digit NAICS | 1996-2016 | unbalanced | no winsorization | Dynamic panel (2 lags | 2-step)]

4-digit NAICS | 1996-2016 | unbalanced | **no winsorization** | dynamic panel (2 lags | 2-step)												
	MHHIΔ (traditional)			MHHIΔ (equal share)			MHHIΔ (nc owner)			MHHIΔ (rescaled)		
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
PM (t-1)	0.1585****	0.1244****	0.1416****	0.1623****	0.1269****	0.1424****	0.1572****	0.1246****	0.1418****	0.1578****	0.1241****	0.1413****
	(0.0288)	(0.0308)	(0.0337)	(0.0298)	(0.0314)	(0.0355)	(0.0298)	(0.0307)	(0.0337)	(0.0294)	(0.031)	(0.0334)
HHI	0.0295	0.0130	-0.0155	0.0269*	0.0169	-0.0108	0.0225	0.0168	-0.0117	0.0280	0.0127	-0.0131
	(0.0207)	(0.0216)	(0.0214)	(0.0158)	(0.0218)	(0.0223)	(0.0173)	(0.0232)	(0.02)	(0.0192)	(0.0218)	(0.0219)
MHHIΔ (traditional)	-0.0019	-0.0054	-0.0074									
	(0.0046)	(0.0049)	(0.0058)									
MHHIΔ (equal share)				-0.0058	-0.0112**	-0.0099*						
				(0.004)	(0.0057)	(0.0058)						
MHHIΔ (nc owner)							0.0001	-0.0013	-0.0028			
							(0.003)	(0.0037)	(0.0043)			
MHHIΔ (rescaled)										-0.0013	-0.0047	-0.0062
										(0.0044)	(0.0052)	(0.0062)
IS		0.0277**	0.0355***		0.0255*	0.0314**		0.0234**	0.0304**		0.027**	0.0337**
		(0.0122)	(0.0136)		(0.0132)	(0.0146)		(0.0114)	(0.0136)		(0.0121)	(0.0133)
C		-0.2933*	-0.0060		-0.2667*	0.0019		-0.3125**	-0.0321		-0.2997**	-0.0170
		(0.1555)	(0.1191)		(0.1558)	(0.1126)		(0.156)	(0.111)		(0.1527)	(0.1193)
DS			-0.0237			-0.0187			-0.0262			-0.0232
			(0.021)			(0.0217)			(0.0227)			(0.0211)
GC			-0.0336*			-0.0328*			-0.0255			-0.0305*
			(0.0185)			(0.0183)			(0.0174)			(0.0187)
AB 2 (p)	0.8370	0.5980	0.2280	0.8740	0.6210	0.2370	0.8300	0.5740	0.2290	0.8340	0.6020	0.2280
Hansen (p)	0.2400	0.1890	0.3750	0.4800	0.1890	0.3750	0.4240	0.2810	0.2440	0.2550	0.1980	0.3330
# of industry-year observations	3513	3513	2612	3513	3513	2612	3513	3513	2612	3513	3513	2612

Regression results according to equation (8) and derived models M1 to M12. *,**,***,**** indicate statistical significance at the 0.1, 0.05, 0.01, and 0.001 level, respectively. Standard errors are provided in parentheses.

Table AD.9: Regression results - dependent variable: profit margin [4-digit NAICS | 1996-2016 | unbalanced | no winsorization no filters | Dynamic panel (2 lags | 2-step)]

4-digit NAICS | 1996-2016 | unbalanced | **no winsorization** | **no filters** | dynamic panel (2 lags | 2-step)												
	MHHIΔ (traditional)			MHHIΔ (equal share)			MHHIΔ (nc owner)			MHHIΔ (rescaled)		
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
PM (t-1)	0.1586****	0.1248****	0.1419****	0.16****	0.1271****	0.1423****	0.1581****	0.1252****	0.1411****	0.1582****	0.1243****	0.142****
	(0.0282)	(0.0311)	(0.0336)	(0.0297)	(0.0315)	(0.0344)	(0.0292)	(0.0307)	(0.0337)	(0.029)	(0.0312)	(0.0337)
HHI	0.0297*	0.0171	-0.0105	0.0286*	0.0201	-0.0108	0.0295*	0.0192	-0.0111	0.0309*	0.0163	-0.0111
	(0.0184)	(0.0213)	(0.0226)	(0.0175)	(0.0222)	(0.022)	(0.0182)	(0.0232)	(0.0203)	(0.0181)	(0.0216)	(0.0233)
MHHIΔ (traditional)	-0.0013	-0.0030	-0.0025									
	(0.0029)	(0.0031)	(0.0035)									
MHHIΔ (equal share)				-0.0035	-0.0049*	-0.0021						
				(0.0024)	(0.0027)	(0.0029)						
MHHIΔ (nc owner)							0.0015	0.0011	0.0007			
							(0.0024)	(0.0026)	(0.0028)			
MHHIΔ (rescaled)										-0.0018	-0.0043	-0.0047
										(0.0043)	(0.0049)	(0.0054)
IS		0.0267**	0.0356**		0.024*	0.0329**		0.022*	0.0319**		0.0262**	0.034**
		(0.0134)	(0.0149)		(0.0136)	(0.0159)		(0.0122)	(0.0149)		(0.0132)	(0.014)
C		-0.2897*	-0.0187		-0.2722*	-0.0049		-0.3184**	-0.0367		-0.3029**	-0.0237
		(0.1503)	(0.1218)		(0.1542)	(0.1123)		(0.158)	(0.1152)		(0.1527)	(0.1206)
DS			-0.0260			-0.0264			-0.0312			-0.0237
			(0.0216)			(0.0218)			(0.0223)			(0.0212)
GC			-0.0326*			-0.0327*			-0.0268			-0.0304*
			(0.0191)			(0.0187)			(0.0179)			(0.0189)
AB 2 (p)	0.8350	0.5980	0.2190	0.8580	0.6180	0.2240	0.8400	0.5730	0.2240	0.8270	0.5850	0.2200
Hansen (p)	0.2290	0.1580	0.2540	0.2360	0.3260	0.3340	0.2590	0.2830	0.2610	0.2140	0.1740	0.2660
# of industry-year observations	3516	3516	2612	3516	3516	2612	3516	3516	2612	3516	3516	2612

Regression results according to equation (8) and derived models M1 to M12. *,**,***,**** indicate statistical significance at the 0.1, 0.05, 0.01, and 0.001 level, respectively. Standard errors are provided in parentheses.

Table AD.10: Regression results - dependent variable: profit margin [4-digit NAICS | 1996-2016 | unbalanced | dynamic panel (3 lags | 2-step)]

4-digit NAICS | 1996-2016 | unbalanced | dynamic panel (**3** lags | 2-step)												
	MHHIΔ (traditional)			MHHIΔ (equal share)			MHHIΔ (nc owner)			MHHIΔ (rescaled)		
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
PM (t-1)	0.2267****	0.2085****	0.1977****	0.2194****	0.2127****	0.1976****	0.2097****	0.2086****	0.1985****	0.2313****	0.2088****	0.1973****
	(0.056)	(0.0568)	(0.0561)	(0.0535)	(0.0552)	(0.0569)	(0.051)	(0.0577)	(0.0589)	(0.0552)	(0.0562)	(0.0555)
HHI	0.0285	0.0160	0.0032	0.0267	0.0273*	0.0070	0.0312	0.0125	-0.0014	0.0298	0.0158	0.0028
	(0.0214)	(0.0142)	(0.0159)	(0.0196)	(0.0165)	(0.0174)	(0.0199)	(0.0144)	(0.0167)	(0.0222)	(0.014)	(0.0165)
MHHIΔ (traditional)	-0.0025	-0.0053	-0.0038									
	(0.0048)	(0.0044)	(0.005)									
MHHIΔ (equal share)				-0.0067	-0.0087*	-0.0054						
				(0.0049)	(0.0052)	(0.0054)						
MHHIΔ (nc owner)							-0.0041	-0.0032	-0.0029			
							(0.0031)	(0.0039)	(0.0041)			
MHHIΔ (rescaled)										-0.0027	-0.0057	-0.0044
										(0.005)	(0.0047)	(0.0056)
IS		0.0414***	0.0408***		0.042***	0.0416***		0.0433**	0.0422***		0.0416***	0.0406***
		(0.016)	(0.0138)		(0.016)	(0.0133)		(0.0169)	(0.0145)		(0.0158)	(0.0137)
C		0.0427	0.1007		0.0361	0.1083		0.0455	0.0913		0.0383	0.0921
		(0.112)	(0.1097)		(0.0992)	(0.107)		(0.1058)	(0.1143)		(0.1115)	(0.1072)
DS			-0.0195			-0.0188			-0.0195			-0.0201
			(0.0188)			(0.0186)			(0.0178)			(0.0192)
GC			-0.0280			-0.0275*			-0.0223			-0.0265
			(0.0185)			(0.0165)			(0.0166)			(0.0183)
AB 2 (p)	0.6530	0.4210	0.4070	0.6970	0.4350	0.4210	0.7550	0.3960	0.3810	0.6360	0.4110	0.4040
Hansen (p)	0.1130	0.0840	0.2680	0.1690	0.2680	0.3550	0.2360	0.0960	0.2390	0.1340	0.0930	0.2730
# of industry-year observations	2450	2450	2443	2450	2450	2443	2450	2450	2443	2450	2450	2443

Regression results according to equation (8) and derived models M1 to M12. *,**,***,**** indicate statistical significance at the 0.1, 0.05, 0.01, and 0.001 level, respectively. Standard errors are provided in parentheses.