From Payer to Provider: Impacts of Insurer Vertical Expansion into Physician Services *

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Abstract

Vertical integration can both create efficiencies and harm competition. We examine these tensions through one of the most prominent forms of vertical integration in the United States: the acquisition of physician practices by the nation's largest insurer, UnitedHealth Group. Using a difference-in-differences design and Medicare administrative data, we find minimal changes to acquired practice case mix or care quality, but do find evidence of increased coding intensity. Insurer-provider integration can have significant fiscal externalities.

Keywords: Insurer vertical integration, primary care, health care markets, UnitedHealthcare

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1 Introduction

A long-recognized tension in regulatory economics and policy is the balance between potential efficiency benefits of consolidation with potential harms to consumers. This tension is most pronounced in vertical consolidation, where efficiencies can be generated through eliminating "double marginalization" and by creating supply chain efficiencies. At the same time, vertical consolidation can also harm competition, particularly through foreclosure to rivals (Crawford et al., 2018; Luco and Marshall, 2020). The net impacts of these two potentially offsetting impacts are often ambiguous and require empirical investigation. The ambiguity of the potential effects of vertical integration are further complicated in markets where costs are publicly financed, but decisions are made by disaggregated consumers and firms.

These tensions are particularly relevant in US health care markets, which have seen growing vertical integration of different forms. Traditionally, health care vertical integration has involved vertical linkages between hospitals and "upstream" or ancillary providers, most commonly physician practices. Across several specialties, the share of physicians employed by a hospital or health system increased from approximately 15% in 2007 to over 30% in 2017 (Nikpay et al., 2018). By 2022, almost 50% of primary care physicians were affiliated with hospitals (Singh et al., 2025). This form of vertical integration can both exploit differences in payment rates between hospital and non-hospital settings that exist among both public (e.g., Medicare) and private insurers, and enable larger hospitals to negotiate prices on behalf of acquired smaller practices. Accordingly, numerous studies have examined this form of vertical consolidation and have found evidence of increased prices and changes in referral patterns without improvements in care quality (Baker et al., 2014, 2016; Koch et al., 2021; Richards et al., 2022; Whaley and Zhao, 2024). However, another trend is the emergence of vertical integration between physicians and insurers. The rise of "payvider" integrated firms is more recent, and, in part due to the high concentration of US insurers, driven by fewer acquiring firms.

In this paper, we examine the potential impacts of this emerging insurer-provider verti-

cal integration. There are several ways that insurer-provider integration may affect health care markets. On the one hand, insurer-provider integration can align incentives between physicians and insurers, particularly in "value-based" payment models that pay physicians capitated payments, instead of the more traditional "fee-for-service" payments. These forms of integration are particularly relevant to, and in many cases driven by, the accompanying increase in Medicare Advantage and "value-based" payment models. Similarly, integration can also synchronize electronic health record and other IT tools and reduce frictions that prompt insurers to implement prior authorization and other requirements. On the other hand, insurer-provider integration can potentially disadvantage rivals if integrated providers restrict access from patients from other insurers or use their position as the patient's physician to encourage selection of the integrated insurers' health plan.

An under-explored impact is how insurer-provider integration interacts with public insurance financing of insurance products. In payment models where insurer payment is based on provider diagnosis of patient risk, integration can align incentives for physicians to code more intensely (Geruso and Layton, 2020; Meyers et al., 2025). Risk-based models are the basis of payment to Medicare Advantage (MA) plans, which now account for over half of the Medicare population. A key challenge with risk-based payment models is that a patient's "true" risk is unobserved; instead, it is diagnosed and determined by physicians, which in turn determine the financial payments made to insurers. As demonstrated in Meyers et al. (2025), insurer-provider vertical integration can align previously differing incentives between insurance companies and physicians to more intensely code patients, and thus increase risk-based payments. Insurer-provider integration can also lead to concerns of using acquisitions as a form of inter-party transfer to limit the impacts of insurer regulations to allocate resources to patient care expenses.[1]

Yet, despite the growth and policy concerns on the impacts of insurer-provider vertical

[1]A related concern is that insurer-provider integration can create incentives to increase payments to owned providers to reduce exposure to the ACA medical loss ratio regulation, which requires insurers to spend 80% to 85% of premium dollars on health expenses.

integration, empirical evidence remains limited. We investigate whether insurer-provider integration leads to foreclosure of rivals, increased government spending, or better health care quality. We examine these questions through the lens of physician practices acquired by the nation's largest insurer, UnitedHealth Group. Through its subsidiary, Optum, UnitedHealth has rapidly expanded into physician and other provider markets (Weaver et al., 2024; Herman et al., 2024). As a result, recent estimates suggest that Optum controls about 3% of the primary care physician market (Adler et al., 2025). Concerns of potential harms to consumers and markets have led to several policy proposals, including banning ownership of physicians by insurers and even breaking up UnitedHealth and its subsidiaries into separate, independent companies. Concerns related to billing practices have led to Department of Justice (DOJ) and Congressional investigations (Abelson, 2025; Ross et al., 2024). Existing studies find evidence of higher commercial prices among acquired practices (Arnold and Fulton, 2025), but price differences appear to be driven by compositional differences rather than changes following acquisition (Lake et al., 2025). However, evidence on the impacts of these transactions on publicly financed programs, both those administered by CMS and those managed by private insurers but financed by CMS, is limited.

We examine the effects of UnitedHealth acquisitions of primary care providers by combining administrative data from 2016 to 2022 on a 20% sample of Medicare beneficiaries enrolled in either MA or traditional Medicare (TM) with manually collected data on acquisitions. A key empirical challenge with studying the impacts of these transactions is identifying transactions and their timing. Many physician practice acquisitions are structured through management services organizations (MSOs) and other entities, and thus are not required to be fully reported to regulators in the same manner as if a physician were directly employed by an insurer. As a result, commonly used approaches to identify changes in ownership, such as observing changes in billing patterns or CMS administrative data, are not sufficient.

To more completely identify transactions, we use Securities and Exchange Commission (SEC) annual filings on directly owned or managed subsidiaries. We pair the SEC data

with data from state insurance department regulatory filings on UnitedHealth's subsidiaries. We use text-processing and mapping techniques to link these data to Centers for Medicare and Medicaid (CMS) data on provider identifiers that we can link to medical claims data. Using annual updates to all three sources of data, we are able to identify 210 acquisitions of physician practices by Optum or Optum-affiliated organizations. We focus on acquisitions that occurred during the 2017 to 2022 period and link these acquisitions to about 4,500 unique primary care providers whose practices were acquired during 2017 to 2022. Among these providers, we attribute all TM and MA patients who receive primary care services from them. Using this data and a stacked difference-in-differences design, we study the causal effect of UnitedHealth acquisitions on patient case mix, risk coding, and outcomes.

We find that UnitedHealth's acquisitions led to minimal changes in Medicare case mix or in the quality of care but substantial changes to risk coding. First, we find that there was only a modest one percentage point increase in the share of patients with UnitedHealth MA coverage, which was offset by a decline in the share of patients with other MA coverage. While there is anecdotal evidence suggesting that UnitedHealth uses primary care to foreclose on its rivals, we find only limited empirical evidence of this effect overall (Pifer Parduhn, 2025). While we find modest effects on payer mix overall, we find that these effects were driven entirely by clinicians in areas with low initial UnitedHealth market share in the MA market. This finding suggests that UnitedHealth may potentially use acquisitions to foreclose on its rivals in areas where it may be trying to grow its presence but not in areas where they exercise market power in the insurance market. Second, we find no evidence of improvement in care quality, as measured by the share of patients with an inpatient admission or emergency department visit during the year.

Where we do find large impacts involves how UnitedHealth is paid for providing insurance services by the federal government. After acquisition, we find substantial increases in patient risk scores used to modify plan payments. Risk scores for patients attributed to acquired primary care providers who were enrolled in UnitedHealth MA plans increased by

approximately 6% after acquisition. These results are robust to inclusion of patient fixed effects, suggesting that this is not driven by seeing sicker patients, but rather by changes in coding practices, which are a core concern in MA payment policy (Medicare Payment Advisory Commission, 2025). In our event studies, we find immediate increases in attributed patient risk scores, which steadily increase in each subsequent year. Relative to baseline, mean risk scores increase by approximately 15% by the third year post-acquisition.

Importantly, these changes in coding practices spillover to both TM and non-UnitedHealth MA patients, whose risk scores also increased despite UnitedHealth having no incentive to change the risk scores for patients not enrolled in their health care plans. This spillover is likely due to changes in physician practice patterns that do not depend on the insurance coverage of individual patients. In other contexts, several studies document the consistency of provider practice patterns, regardless of patient insurance type (Chen et al., 2022; Geruso and Richards, 2022; Einav et al., 2020; Meyers et al., 2019; Wilcock et al., 2020).

The changes to risk scores of MA patients across insurers result in a substantial fiscal externality. Our estimates imply that UnitedHealth's acquisitions led to a $265 million increase in federal spending on the MA program in 2022 due to increased risk coding intensity. However, because we find only limited evidence of patient foreclosure from other insurers, which would be measured by "business stealing" of covered beneficiaries, the increased coding intensity among acquired practices benefits other MA insurers. Our estimates imply that UnitedHealth's acquisitions led to a $167 million increase in payments to other payers. Thus, of the increased government spending to MA plans due to increased risk coding intensity among physician practices acquired by UnitedHealth, UnitedHealth is only able to capture 37 percent of the increased revenue, while other MA plans capture the remaining 63 percent. Limits to the ability to foreclose patient volume from other insurers restrict UnitedHealth's ability to fully capture the financial benefits of increased coding intensity, but substantially benefit other insurers.

Our paper contributes to the literature in several ways. First, we contribute to the long-

standing literature on vertical integration (Bresnahan and Levin, 2012). Across settings, a key consideration in this literature is the tradeoff between the potential for economies of scale or scope and the potential that vertical integration can be used to disadvantage rivals (Boehm and Sonntag, 2023; Crawford et al., 2018; Gray et al., 2023; Hortaçsu and Syverson, 2007; Luco and Marshall, 2020; Ordover et al., 1990). For example, research on the multichannel television market demonstrates that vertical integration can reduce prices through reductions in double marginalization but have anti-competitive foreclosure effects depending on how the market is regulated (Crawford et al., 2018). Alternatively, research in the cement industry found little evidence of vertical integration-induced foreclosure (Hortaçsu and Syverson, 2007).

Second, and more narrowly, we extend recent studies on the impact of vertical integration in US health care markets to focus on a more recent, and more ambiguous form of integration. The bulk of vertical integration activity, and thus research, has focused on hospital-physician integration. Several studies have used changes in Medicare billing patterns or surveys of physicians to identify hospital-physician vertical integration. These studies find that integrating with a larger hospital allows physicians to capture the externality of the hospital negotiating prices on their behalf (Peters, 2014). As a result, physician prices negotiated with commercial insurers increase following hospital-physician vertical integration (Baker et al., 2014, 2016). Similarly, several studies document a change in referral patterns to higher-priced hospital settings, leading to an additional increase in spending (Richards et al., 2022; Whaley and Zhao, 2024; Cooper et al., 2025). In addition to price changes, other work shows that hospital-physician integration can increase coding intensity in traditional Medicare (Post et al., 2022). Despite claims of quality improvements, studies do not find consistent or large changes in quality, suggesting that potential efficiencies of vertical integration do not directly benefit patients (Post et al., 2018; Damberg et al., 2024). Other recent research focuses on integration between hospitals and insurers, both in the US and in other settings, finding evidence of foreclosure in this setting (Diebel, 2022; Cuesta et al.,

2024).

Finally, we contribute to the literature on the effects of contracting with private insurers on public health insurance spending (Brown et al., 2014; Duggan and Hayford, 2013; Geruso and Layton, 2020; Ryan et al., 2023; Layton and Politzer, 2025). Coding intensity in Medicare is a key driver of spending, though the mechanisms for how this is achieved are relatively understudied (Meyers and Trivedi, 2021; James et al., 2024). We add to past research by Geruso and Layton (2020) and contemporaneous research by Meyers et al. (2025) demonstrating the importance of insurer-provider vertical integration as a mechanism for increasing Medicare spending.

2 Background on UnitedHealth

UnitedHealth is the largest health insurer in the United States, through its insurance subsidiary, UnitedHealthcare. It operates across all of the major types of health insurance markets, including the employer market, the Affordable Care Act exchanges, MA, and Medicaid managed care. It is the nation's largest MA insurer, covering 29% of MA beneficiaries (Ochieng et al., 2025). It is also the country's largest commercial insurer, covering 16% of the market, and the third largest Medicaid managed care insurer, covering 9% of the market (Hinton and Raphael, 2025; Guardado and Kane, 2025). UnitedHealthcare has broad geographic reach and is often the largest or second largest insurer across a geographically diverse set of states (Guardado and Kane, 2025).

UnitedHealthcare's insurance practices have attracted significant attention from lawmakers. A major area of concern has been UnitedHealthcare's coding practices in Medicare Advantage. For example, Senator Grassley recently released an extensive report detailing how UnitedHealth ensures that its patients have diagnoses coded with greater intensity than beneficiaries in traditional Medicare or other Medicare Advantage plans. One mechanism the report cited was vertical integration with providers in order to control their coding-related

processes (Grassley, 2026). Researchers estimate that UnitedHealthcare received $12 billion in overpayments because of high coding intensity, more than any other insurer (Center for Advancing Health Policy Through Research, 2025).

However, UnitedHealth is not just an insurer. It has a large number of subsidiaries that make it increasingly important across the entire health care system. For example, one of its subsidiaries, OptumRx, is the country's largest pharmacy benefit manager (Guardado, 2025). Another subsidiary is Change Healthcare, a claims processing company that processes 40% of claims in the US, which was a victim of a cyberattack that led to major disruptions in claims processing throughout the health care system (House Committee on Energy and Commerce, 2024).

UnitedHealth is increasingly purchasing provider organizations. It has not only been acquiring primary care providers–the focus of this paper–but a broad array of provider types (Adler et al., 2025; Arnold and Fulton, 2025). For example, starting in 2017 UnitedHealth began purchasing ambulatory surgical centers and by 2023 it owned over 200 (Zhao et al., 2024). In 2023, UnitedHealth acquired one of the country's largest home health providers, LHC group (Parduhn, 2023). In 2025, it finalized the acquisition of a second large home health care firm, Amedisys, which had initially been blocked by the DOJ over anti-trust concerns (Parduhn, 2025).

The scope of UnitedHealth's vast holdings has increasingly attracted the scrutiny of anti-trust regulators and lawmakers. The DOJ has unsuccessfully attempted to block several of UnitedHealth's recent acquisitions, including their acquisition of the technology company Change Healthcare (Liss, 2022). In 2024, the DOJ began investigating UnitedHealth over anti-trust concerns related to its acquisitions of physician practices (Mathews and Michaels, 2024). In 2025, lawmakers proposed legislation that would prohibit insurers from owning provider practices, specifically citing UnitedHealth's acquisitions as a reason for advancing this proposal (Merkley, 2025).

3 Data

3.1 Measuring Insurer-Physician Vertical Integration

3.1.1 CMS Practice Ownership Data

To identify practices acquired by and physicians employed by Optum, we first use administrative data collected by the Centers for Medicare and Medicaid Services (CMS) that are designed to track physician employment. We rely on two data sources. First, we use the annual Medicare Data on Provider Practice and Specialty (MD-PPAS) files. For each clinician, identified by the provider's National Provider Identifier (NPI) that bills traditional Medicare, the MD-PPAS data lists the frequency of billing tax identification numbers (TINs) under which the provider bills.

Our second source of CMS data are the Provider Enrollment, Chain, and Ownership System (PECOS) files. The PECOS data are used by CMS to track ownership of entities billing Medicare. Each entity, including physician practices, is required to update and attest to the accuracy of ownership. For each provider practice, the PECOS data list the TIN of the direct owner of the practice. Yet, as reported by others, this direct ownership linkage is often too narrow to encompass most health systems (Ridgely et al., 2021). Concerns also exist on the accuracy of updates to PECOS.[2]

3.1.2 SEC 10-K Filings

While the MD-PPAS and PECOS data are useful for identifying explicit ownership arrangements, many practices are managed through management service organizations or other entities, which employ physicians, rather than being directly employed by an insurer. This arms-length relationship buffers individual physicians from reporting direct employment to an insurer or other entity in CMS data. Yet, these physicians are likely practically still under

[2]For example, the CMS Office of Inspector General has found inaccuracies in the PECOS data: https://oig.hhs.gov/oei/reports/oei-07-08-00181.pdf

their oversight and managerial control.

To examine these types of affiliations to Optum, we first follow the approach used in Zhao et al. (2024) to identify Optum ownership of ambulatory surgical centers (ASCs). Each publicly traded company is required to report an overview of their organization's financial status through Form 10-K on an annual basis. As part of this reporting, firms are required to list all subsidiaries in which the company has direct ownership or managerial control.

For each year, we extracted the list of United/Optum subsidiaries and text matched them to the list of provider names in the Trilliant Health data using an exact name matching approach to get the organization national provider identifiers (NPIs). Then, through Clarify data, we crosswalk the organization NPIs to tax identifier numbers (TINs).

3.1.3 State Insurance Commission Regulatory Filings

We supplement the SEC filings with similar regulatory filings that insurers are required to submit on a quarterly basis to the Tennesee Department of Insurance. Similar to the 10-K filings, these filings include lists of subsidiaries. However, they also include the federal tax identification number (TIN) for each subsidiary. Importantly, these subsidiary linkages exist for all subsidiaries, including international subsidiaries. One limitation of these filings is that they are posted in PDFs of several hundred pages. To parse each quarter's filing, we used an optical character recognition (OCR) image recognition approach to extract a set of TINs from each PDF.[3] Further details of this data collection process are described in the Appendix.

Appendix Figure A1 presents descriptive trends in UnitedHealth's acquisition of physician practices over the 2012 to 2023 period. Acquired practices are identified through their tax identification number (TIN). These acquisitions have steadily accumulated in each year, with the exception of 2013, where we do not observe any acquisitions. 2020 saw the largest number of acquisitions, with nearly 60 practice acquisitions. By 2023, we find a total of 210

[3]We used the pytesseract python OCR package.

acquired practices.

We compiled a list of practice groups, identified by TINs, along with the first and last year each group was owned by UnitedHealth, using data from SEC filings and state insurance commission regulatory reports. We then linked these TINs to NPIs via MD-PPAS to identify physicians who became affiliated with UnitedHealth as a result of practice group acquisitions.

3.2 Traditional Medicare Claims and Medicare Advantage Encounter Data

We use a 20% sample of TM claims and MA encounter data from 2016-2022 to calculate our outcomes variable. To do so, we first attributed both TM and MA beneficiaries to their PCP. We used standard office visit claims and encounters (CPT codes 99201-99205, 99211-99215) where the clinician's specialty is internal medicine, family medicine, obstetrics & gynecology, nurse practitioner, or physician assistant, as indicated by the primary taxonomy codes in the National Plan and Provider Enumeration System (NPPES) and the classification approach by the National Uniform Claim Committee.[4] We attribute each beneficiary to the clinician where they had the plurality of visits in the given year, breaking ties randomly. Beneficiaries without an office visit during the year are not attributed to a PCP.

We summarize information about each PCP's attributed patients at the provider-year level. First, using the Medicare Master Beneficiary Summary File (MBSF) we calculate the share of attributed beneficiaries enrolled in TM, in MA, in a UnitedHealth MA plan, and in a non-UnitedHealth MA plan. Second, we calculate several measures of patient case mix using the MBSF, including the share of attributed patients dually eligible for Medicaid, White, and female, as well as the average age. Third, we use claims and encounter data to

[4]Some additional cleaning is needed for the encounter data. First, the rendering NPI can be missing in the encounter data. However, it often appears in the organization NPI field. We use the organization NPI field for claims where this is populated by an individual clinician's NPI, following past work (Xu et al., 2023). Second, there can also be duplicate records in the encounter data (Jung et al., 2022). We de-duplicated encounters to be unique to the beneficiary-NPI-date. To ensure consistency, we did the same with fee-for-service claims.

calculate Hierarchical Condition Category (HCC) scores for attributed beneficiaries. We use version V24 for all years. Finally, we calculate the share of attributed beneficiaries that had an inpatient admission using Medicare Provider Analysis and Review (MedPAR) and the share of attributed beneficiaries that had an emergency department (ED) visit using claims and encounter data.

We include providers in the 50 states and DC with attributed beneficiaries in at least two years from 2016-2022. We exclude provider-years with no attributed beneficiaries. We study the acquisitions that occurred between 2017 and 2022. We therefore exclude a small number of 'always treated' providers, who we identified as being employed by Optum before 2017. Our final sample consists of 385,017 providers and 2,152,511 provider-years. The number of attributed beneficiaries by insurer and year is shown in Appendix Table A1.

4 Empirical Approach

Our aim is to estimate changes in several dimensions of physician behavior following acquisition of that physician's practice by UnitedHealth. To do so, we use a stacked difference-in-differences design to estimate the effect of UnitedHealth acquisitions on practice patterns and patient outcomes. This approach is commonly used in settings where treatment is staggered across periods, as it is here for UnitedHealth acquisition (Cengiz et al., 2019; Deshpande and Li, 2019; Chen et al., 2023; Lin et al., 2021; Munnich et al., 2025).

In our stacked difference-in-differences approach, we assign each provider to a cohort. Acquired providers are assigned to cohorts based on their year of acquisition. Non-acquired providers are randomly assigned to a cohort. Within each cohort, this creates a clean difference-in-differences setup that is robust to potential bias due to staggered treatment implementation. We aggregate across cohorts by estimating the following event-study using ordinary least squares regression with cohort-by-year fixed effects:

$$Y_{ict} = \alpha + \sum_{\substack{j=-6 \\ j \neq -1}}^{5} \beta_j \mathbf{1}[Acquired_i \times Time_t = j] + \lambda_i + \tau_{ct} + \varepsilon_{ict} \quad (1)$$

where Y_{ict} is the outcome variable for provider i in year t and cohort c, $1[Acquired_i \times Time = j]$ are a series of indicators equal to 1 if the provider was acquired and relative time is equal to j, λ_i are provider fixed effects, and τ_{ct} are cohort-by-year fixed effects. β_j are the coefficients of interest. We cluster standard errors at the provider level.

As with other difference-in-differences studies, the identifying assumption in this analysis is that outcomes for acquired and non-acquired providers would have continued to follow a parallel path in the absence of the acquisition. While this assumption is fundamentally untestable, we use our event studies to examine whether there were parallel pre-acquisition trends. A related concern is changes to attributed patient composition. We find no changes in patient observables or changes in attributed patient volume. We also find similar results when limiting to a stable pairing of patients and physicians. Our results are also similar when examining patient-level changes in outcomes, which allow us to include patient fixed effects. We also find similar results when disaggregating acquisition cohorts.

We obtain aggregated "2x2" difference-in-differences estimates by estimating the following model:

$$Y_{it} = \alpha + \beta \mathbf{1}[Post_t \times Acquired_i] + \lambda_i + \tau_c t + \varepsilon_{it} \quad (2)$$

where, in addition to the variables defined above, $1[Post_t \times Acquired_i]$ is an indicator equal to one for acquired providers after they are acquired by UnitedHealth. β represents the effect of UnitedHealth acquisition on the outcome. The β coefficient provides an interpretable and mean impact of UnitedHealth acquisition on our selected outcomes.

We also investigate heterogeneity in the effect of UnitedHealth acquisition of payer mix to understand potential mechanisms for the foreclosure of rivals, using differences in counties with low or high UnitedHealth market power at baseline. We link each NPI to a county using their ZIP code (US Department of Housing and Urban Development and US Postal Service,

2025). We then calculate UnitedHealth's share of the county's MA enrollment in January 2016 using publicly available enrollment data (Centers for Medicare and Medicaid Services, 2025). We categorize counties as high (low) UnitedHealth market share if UnitedHealth's market share in the county was greater than or equal to (less than) its median market share across all counties (12.9%).

5 Results

In Figure 1, we show the number of unique primary care providers that were acquired by UnitedHealth during 2017-2022. Over the period, 4,516 clinicians were acquired. The largest acquisitions occurred in 2017 and 2020. The number of Medicare patients treated by UnitedHealth-acquired providers grew over time, representing 546,085 total beneficiaries by 2022, including 100,255 insured by UnitedHealth (see Appendix Table A2). Acquired providers were located throughout the country, with North Carolina and Florida having the highest counts of acquired providers (see Appendix Table A3).

5.1 Effects of UnitedHealth Acquisition on Case Mix

A key concern with this type of vertical integration is that, after acquisition, providers may see fewer patients from competing insurers or encourage them to join a UnitedHealthcare plan, which would represent UnitedHealth using its acquisitions to foreclose on its rivals. We therefore first examine how providers' payer mix changed after acquisition. Panel B of Figure 2 shows that the share of providers' Medicare patients with UnitedHealthcare coverage increased after acquisition. This was offset by a modest decline in the share of an acquired provider's patients with other MA coverage (Panel C). Panel A shows that there was no change in the share of patients with traditional Medicare, except for in the period 5 years after acquisition. The overall difference-in-differences estimates are shown in Appendix Table A4. The modest 0.9 percentage point decline in the share of patients with other MA

coverage represented only a 4 percent decline relative to the baseline mean, suggesting that the foreclosure effect is small.

However, there is substantial heterogeneity in these effects by the baseline market share of UnitedHealthcare in the MA insurance market. The foreclosure effects are concentrated entirely in counties where UnitedHealthcare had less initial market share (Figure 3). The 3.8 percentage point decline in the share of other MA beneficiaries seen by UnitedHealth-acquired clinicians represents 13.4 percent of the baseline mean for acquired providers in these markets. Estimates for changes in payer mix after acquisition in areas where United-Healthcare exerted more market power in the insurance market are precisely estimated null effects.

In the appendix, we also investigated whether the composition of patients seeing acquired providers changed after acquisition. In Appendix Figure A2, we show that there are no changes in the average age or the share of female, White, or dual eligible attributed patients after acquisition. We show overall estimates in Appendix Table A3. These estimates are all small, statistically non-significant, and precisely estimated. For example, the effect of acquisitions on the average age was a decline of 0.049 years (SE=0.081).

5.2 Effects of UnitedHealth Acquisition on Risk Scores

We next examined changes in risk scores. In Figure 4, we show that average HCC risk scores increased substantially following acquisition. For UnitedHealthcare enrollees (Panel C), they increased by 0.081 overall, a 6 percent increase relative to the baseline mean (Appendix Table A6). These effects grew over time. For example, by the third year after acquisition the increase in risk score represented 15 percent of the baseline score.

Interestingly, HCC scores increased not only for UnitedHealthcare enrollees but also for beneficiaries enrolled in TM and other MA non-UnitedHealthcare plans, where UnitedHealth-care does not benefit from higher scores through higher risk-adjusted payments. While the point estimates for TM patients and other MA patients were smaller than for UnitedHealth-

care patients, these estimates were both economically and statistically significant.

However, these changes in HCC scores could reflect either increased coding intensity or a sicker patient panel. In panel B of Appendix Table A4, we estimate the effect of UnitedHealth acquisitions on risk scores at the beneficiary level with beneficiary fixed effects.[5] The results are substantively similar when estimated at the beneficiary level with beneficiary fixed effects. This implies that the increased HCC scores are primarily the result of changes in coding intensity rather than which patients are treated by acquired clinicians.

We also investigate whether there was any heterogeneity in the effect of acquisitions across patient characteristics. We find similar effects across beneficiaries of different ages and for beneficiaries who are and are not dually eligible for Medicaid. We find higher estimates for beneficiaries who had higher initial HCC scores than those who had lower initial HCC scores, though these effects are similar in percentage terms of the different baseline scores.

The changes in HCC scores for MA beneficiaries is consequential for federal spending. In MA, plans receive risk-adjusted per member per month payments. The per member per month payment for the average risk beneficiary is multiplied by the HCC risk score to arrive at the risk-adjusted monthly payment. The average payment to plans is about $12,000 (Ramsay et al., 2024). Using this number, we calculate back-of-the-envelope estimates of how the estimates affect federal spending in Appendix Table A7.

Our estimate implies that these acquisitions increased federal spending by $264.8 million in 2022. Notably, these acquisitions increase payments to non-UnitedHealth MA insurers by more than they increase payments to UnitedHealth ($167.4 million compared to $97.4). This is because the effects on risk scores are similar for UnitedHealth and other MA insurers, while acquired providers continue to see more non-UnitedHealth MA beneficiaries than UnitedHealth MA beneficiaries.

[5]Note that the point estimates differ in these regressions from panel A in part due to the fixed effects but also because the level of analysis is the beneficiary-year rather than the NPI-year. This implies that each beneficiary rather than each NPI is given equal weight, which results in different estimates as well as different baseline means.

5.3 Effects of UnitedHealth Acquisition on Health Care Utilization

We next turn to examining the effect of UnitedHealth acquisitions on health care utilization. In Figure 5, we find no overall changes in the average share of beneficiaries who had inpatient admissions or emergency department visits. In the event-study, there is a modest increase in emergency department visits in the periods 3-5 years after acquisition, though the overall point estimate in Appendix Table A8 is not statistically significant.

However, a key concern is that, despite the lack of observable changes in case mix shown above, there are unobservable changes in patient mix that might influence health care utilization. We therefore also estimate the effect of acquisitions at the beneficiary level and use beneficiary fixed effects to address selection concerns in Appendix Table A8. Using beneficiary fixed effects, we find no effects on either inpatient admissions or emergency department visits.

5.4 Robustness

We conduct several sensitivity analyses to examine the robustness of our results. First, we include only providers who saw patients in all 7 years of the sample (column 2 of Appendix Table A9). Second, we adjust for state linear time trends (column 3) to control for state-specific trends in the outcomes. Third, we include only physicians (column 4). Our results are robust across these different samples/specifications, though the effects the percentages of patients with UnitedHealth and other MA insurer coverage are attenuated in the model including only a balanced panel of providers. Finally, in Appendix Table A10, we examine the robustness of our effects while excluding each treatment cohort. Our results suggest that the effects are not driven by one cohort.

6 Conclusion

Physician vertical integration with health insurers is an emerging form of consolidation in US health care markets. Yet, the expected impacts of this type of consolidation are ambiguous. Across UnitedHealth's acquisitions of primary care practices that employ about 4,500 clinicians, we find limited changes in the composition of patient panels and no evidence of improvements in quality, but substantial changes in the coding practices that determine federal payments to health care plans.

The impacts of vertical integration are ambiguous. One possible positive consequence of insurer-provider vertical integration is that it may help align financial incentives to improve care between insurer and providers. However, we find no evidence to suggest that the quality of care improved after acquisitions. A related concern is potential disadvantages to rival insurers. We find that acquired providers modestly increased the share of UnitedHealthcare patients that they saw, while decreasing the share of beneficiaries with other MA coverage. However, these effects were relatively small, representing a 4 percent decline in other MA patient share relative to the baseline mean. Even after acquisition, acquired providers still saw more patients with other MA coverage than they saw with UnitedHealthcare coverage.

At the same time, there is extensive anecdotal evidence that UnitedHealth uses acquisitions of provider practices to ensure alignment on the coding practices that affect Medicare payments to private plans (Grassley, 2026; Weaver et al., 2024). In MA, plans are paid on a risk-adjusted basis. Greater coding intensity leads to higher payments to plans. Investigations of UnitedHealth have demonstrated that it uses a number of mechanisms, like prompts within electronic health records, to ensure that diagnoses important for payment are recorded during visits (Grassley, 2026; Weaver et al., 2024). We find that risk scores for UnitedHealthcare patients went up 6% after acquisitions. Our estimates of the effect of acquisitions on risk scores are robust to the inclusion of patient fixed effects, suggesting that this is a result of coding changes rather than an increase in the actual risk profile of patients. This represents a substantial fiscal externality for Medicare, totaling about $265

million in 2022. These changes are not fully captured by UnitedHealth. Instead, there are also substantial effects on risk scores for patients insured by other MA carriers, likely due to payer-agnostic changes in practice patterns. Because acquired providers still see more non-UnitedHealthcare MA patients than UnitedHealthcare patients after acquisition, 63 percent of the fiscal externality created by UnitedHealth acquisitions is captured by rival firms.

Insurer acquisitions of provider practices have theoretically ambiguous effects, ranging from improved quality to the anti-competitive disadvantaging of rival insurers. Yet, we find minimal evidence of either of these potential effects. Instead, we find strong evidence that insurer acquisitions of providers lead to increased coding intensity. Due to the structure of publicly financed MA payments, this represents a significant fiscal externality borne by the federal government.

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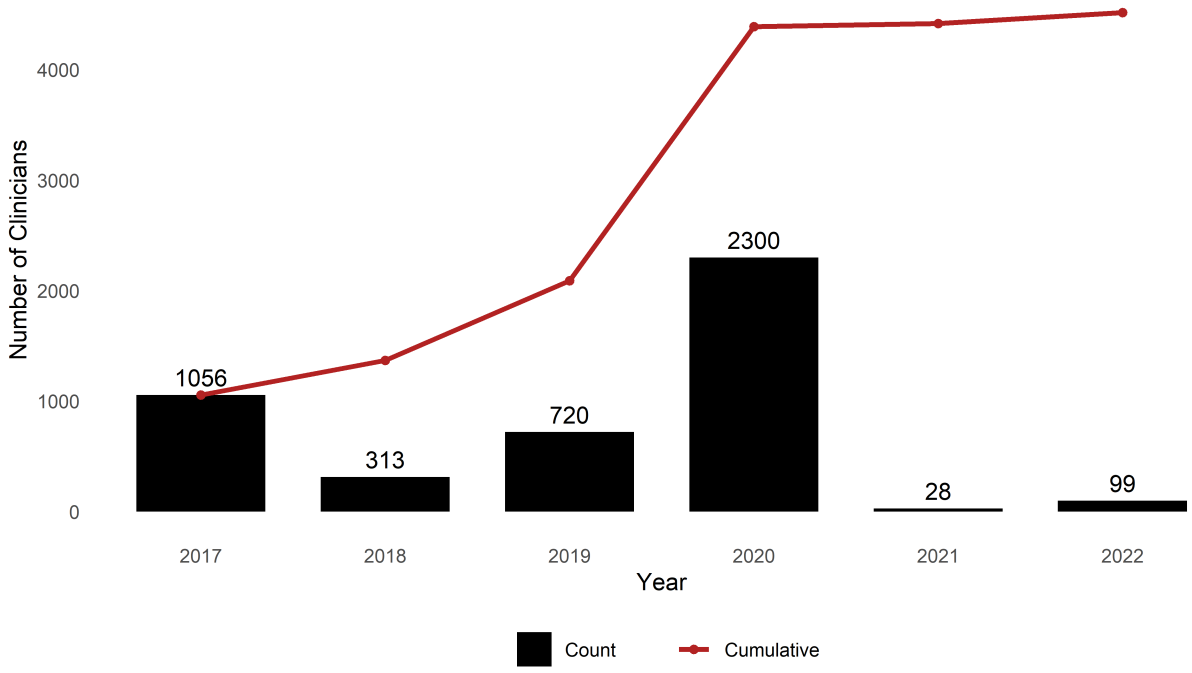
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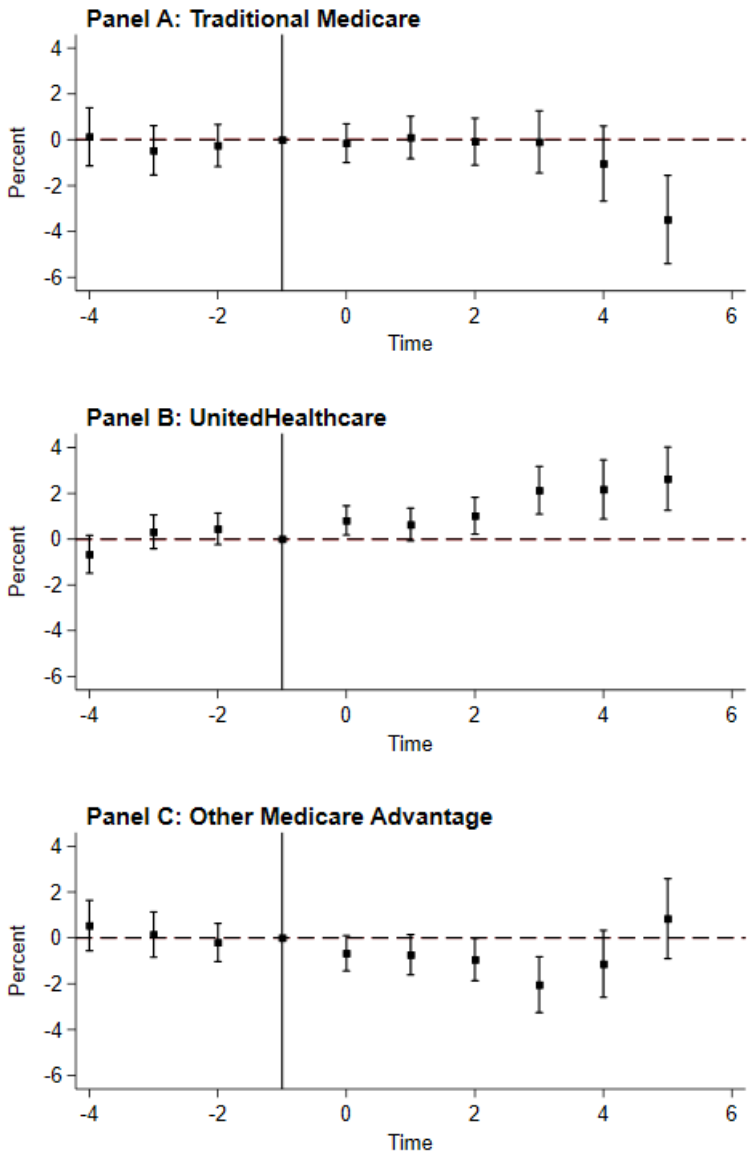
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Figure 1: Time Trend of UnitedHealth's Acquisition of Clinicians



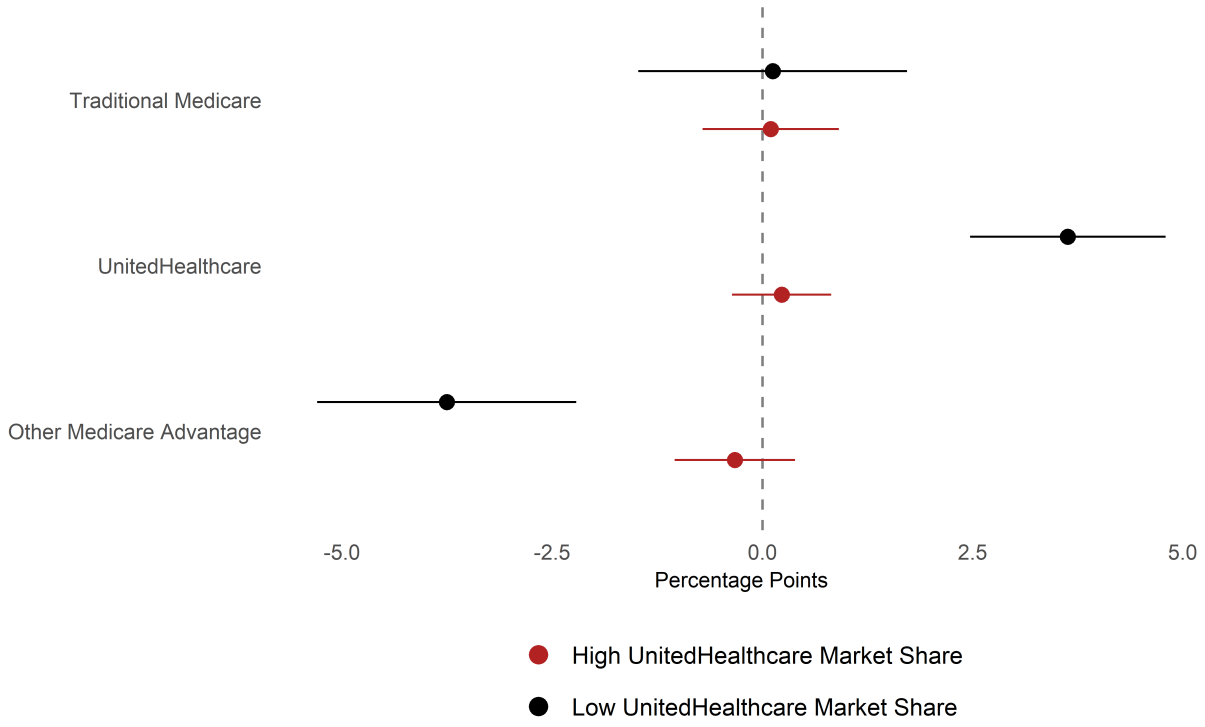
Notes: This figure shows the annual (bar) and cumulative (line) number of clinicians employed by UnitedHealth by acquisition year.

Figure 2: Effect of UnitedHealth Acquisition on Medicare Payer Mix



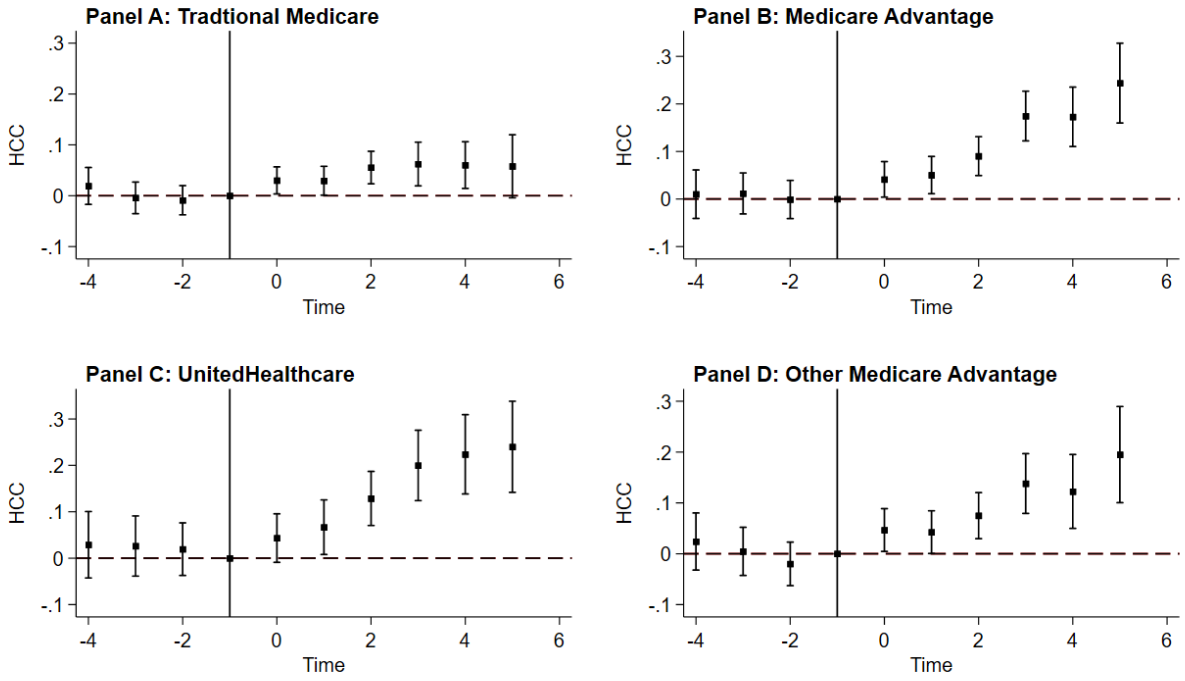
Notes: This figure shows event-study estimates of the effect of UnitedHealth acquisition on the percentage of total attributed Medicare beneficiaries covered by each payer. The unit of observation is the NPI-year. Beneficiaries in both traditional Medicare and Medicare Advantage are attributed to providers on the basis of the plurality of standard office visits during the year. Event-study estimates for event-times before -4 are not shown. Standard errors are clustered at the NPI level.

Figure 3: Heterogeneity of the Effect of UnitedHealth Acquisition on Medicare Payer Mix, by Baseline UnitedHealthcare Medicare Advantage Market Share



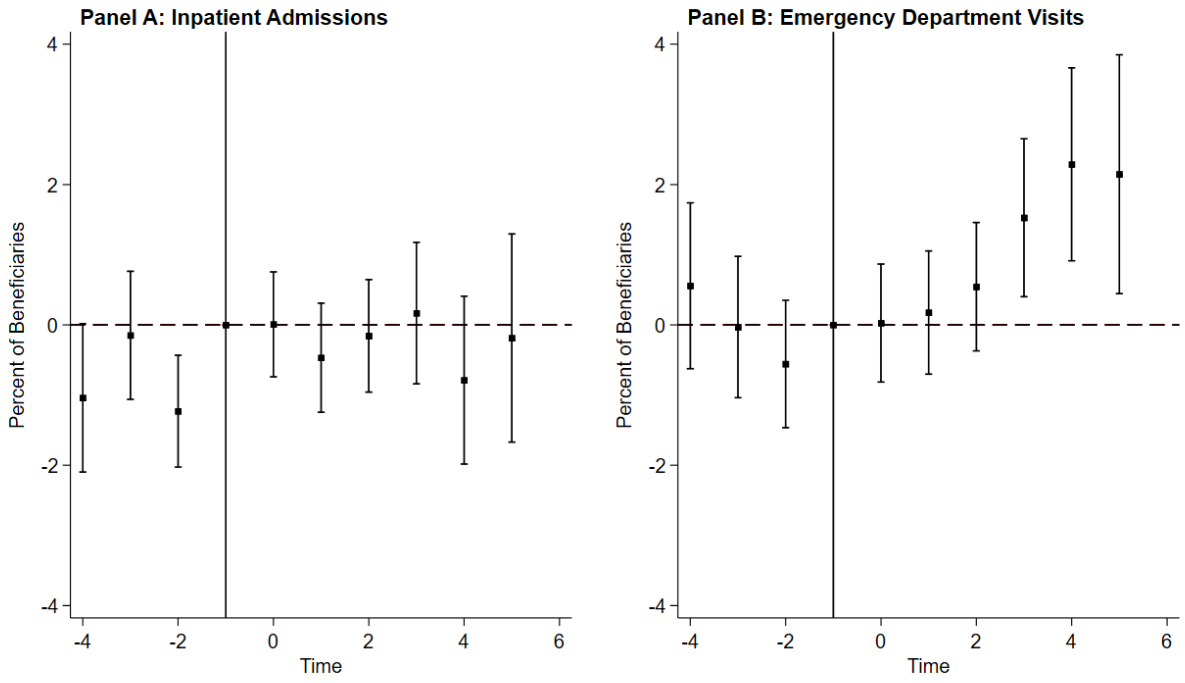
Notes: This figure shows point estimates and confidence intervals for stacked difference-in-differences regressions. Each outcome is the percentage of total attributed Medicare beneficiaries covered by each payer. Regressions for each outcome are estimated separately for NPIs in counties with low and high UnitedHealthcare market share. Each NPI is linked to a county using their ZIP code. The market share for UnitedHealthcare in the Medicare Advantage insurance market was determined using 2016 data. High (low) UnitedHealthcare market share indicates that the county was at or above (below) the median UnitedHealthcare market share.

Figure 4: Effect of UnitedHealth Acquisition on Risk Scores



Notes: This figure shows event-study estimates of the effect of UnitedHealth acquisition on patient Hierarchical Condition Category (HCC) risk scores by insurer. The unit of observation is the NPI-year. Risk scores are the mean risk score of attributed beneficiaries. Beneficiaries are attributed to providers on the basis of the plurality of standard office visits during the year. Event-study estimates for event-times before -4 are not shown. Standard errors are clustered at the NPI level.

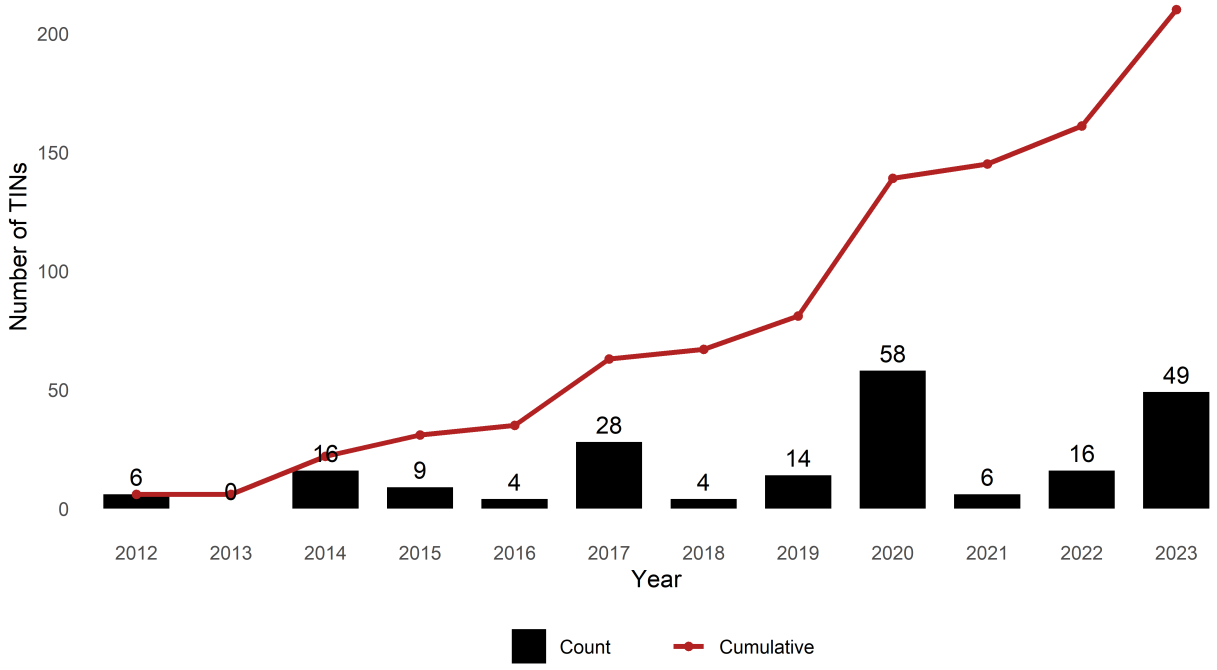
Figure 5: Effect of UnitedHealth Acquisition on Healthcare Utilization



Notes: This figure shows event-study estimates of the effect of UnitedHealth acquisition on health care on the share of beneficiaries–either in traditional Medicare or Medicare Advantage—who had an inpatient admission or an emergency department visit. The unit of observation is the NPI-year. Beneficiaries are attributed to providers on the basis of the plurality of standard office visits during the year. Event-study estimates for event-times before -4 are not shown. Standard errors are clustered at the NPI level.

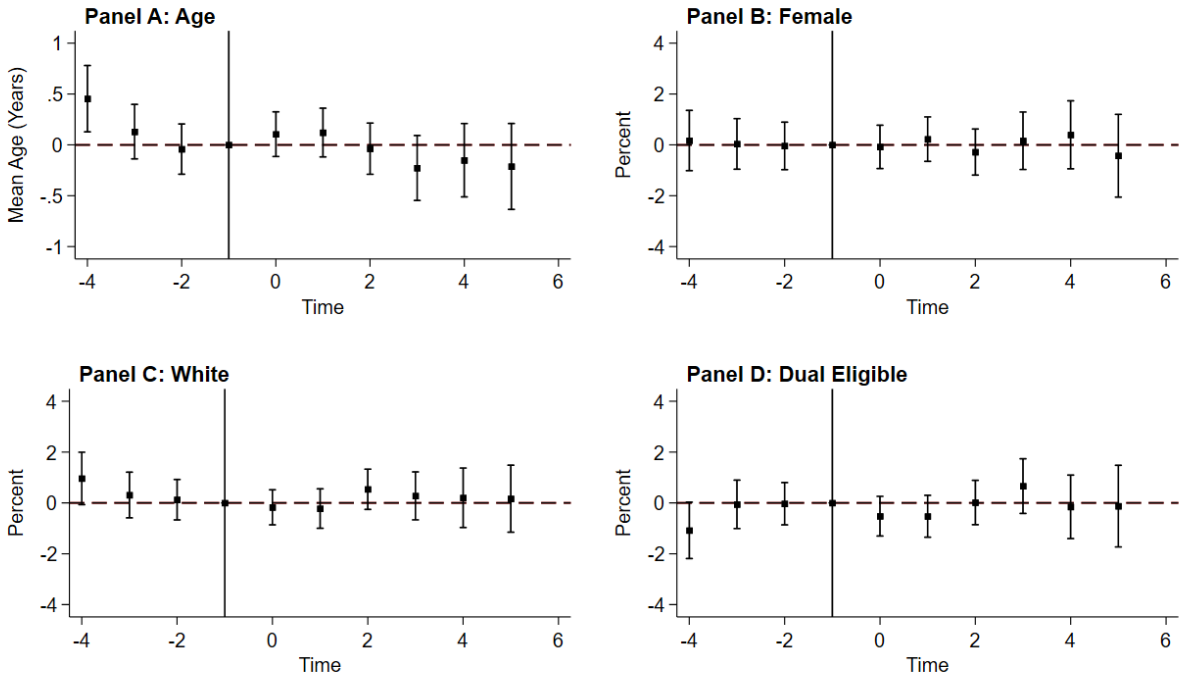
Appendix

Figure A1: Time Trend of UnitedHealth's Acquisition of Provider Practice Groups



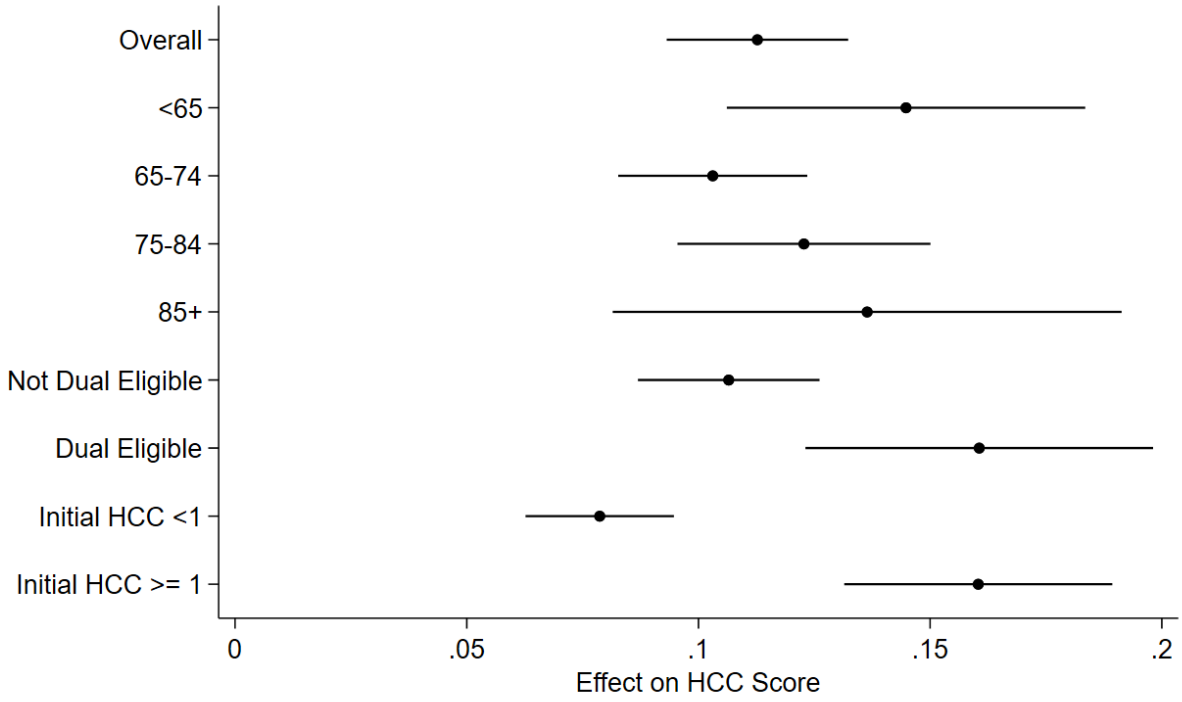
Notes: This figure shows the annual number of acquired practices (left axis and bars) and the cumulative number of practices (right axis and orange line).

Figure A2: Effect of UnitedHealth Acquisition on Case-Mix



Notes: This figure shows event-study estimates of the effect of UnitedHealth acquisition on the case-mix of attributed Medicare beneficiaries. The unit of observation is the NPI-year. Beneficiaries in both traditional Medicare and Medicare Advantage are attributed to providers on the basis of the plurality of standard office visits during the year. Event-study estimates for event-times before -4 are not shown. Standard errors are clustered at the NPI level.

Figure A3: Heterogeneity in the Effect of UnitedHealth Acquisition on Risk Scores



Notes: Values are stacked difference-in-differences estimates. The unit of observation is the beneficiary-year. Each separately-estimated regression includes beneficiary fixed effects. All stratification variables were determined based on the beneficiaries' first year in the data.

Table A1: Number of Attributed Beneficiaries by Insurer and Year

Year	Total	Traditional Medicare	UnitedHealthcare	Other Medicare Advantage
2016	37,959,940	25,961,215	2,711,890	9,286,835
2017	39,112,855	26,161,145	3,168,200	9,783,510
2018	39,771,695	25,757,310	3,722,410	10,291,975
2019	40,292,560	25,400,375	4,166,545	10,725,640
2020	38,998,910	23,562,665	4,344,195	11,092,050
2021	40,118,420	23,008,055	4,887,195	12,223,170
2022	40,976,715	21,892,880	5,426,020	13,657,815

Notes: Entries are the number of beneficiaries attributed to a primary care provider in each year by insurance type. Values are based on the 20% sample and are multiplied by 5.

Table A2: Number of Beneficiaries Attributed to UnitedHealthcare Acquired Providers by Year and Insurer

Year	Total	Traditional Medicare	UnitedHealthcare	Other Medicare Advantage
2017	115,390	80,285	11,875	23,230
2018	155,635	100,240	24,990	30,405
2019	296,075	145,255	44,710	106,110
2020	498,790	252,165	89,495	157,130
2021	522,205	250,225	89,085	182,895
2022	546,085	240,740	100,255	205,090

Notes: Entries are the number of beneficiaries attributed to a primary care provider in each year by insurance type. NPIs are only included during the year of or after acquisition. Values are based on the 20% sample and are multiplied by 5.

Table A3: Characteristics of Providers by Acquisition Status

	Not Acquired	Acquired
Specialty		
Family Medicine	82,661	1,246
Internal Medicine	152,130	1,497
Nurse Practitioner	69,686	716
Obstetrics & Gynecology	26,088	215
Physician Assistant	49,936	842
State		
NC	12,004	1,230
FL	21,329	628
IN	7,627	269
CO	6,333	235
OH	15,366	219
TX	24,052	183
SD	1,135	182
WA	8,751	154
OR	5,286	136
CA	34,507	133
NM	2,217	132
Other	241,894	1,015

Table A4: Effect of UnitedHealth Acquisition on Medicare Payer Mix

	Traditional Medicare	UnitedHealthcare	Other Medicare Advantage
Effect	0.010	0.907***	-0.916**
	(0.367)	(0.267)	(0.332)
NPI-Years	2,152,511	2,152,511	2,152,511
NPIs	385,017	385,017	385,017
Baseline Mean	66.4	10.1	23.5

Notes: Entries are stacked difference-in-differences estimates. The unit of observation is the NPI-year. Beneficiaries are attributed to providers on the basis of the plurality of standard office visits during the year. Baseline means are the mean for treated NPIs in 2016. Standard errors clustered at the NPI level are in parentheses.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A5: Effect of UnitedHealth Acquisition on Case Mix

	Female	White	Age	Dual
Effect	-0.046	-0.172	-0.049	-0.096
	(0.295)	(0.278)	(0.081)	(0.288)
NPI-Years	2,152,511	2,152,511	2,152,511	2,152,511
NPIs	385,017	385,017	385,017	385,017
Baseline Mean	59.7	83.8	71.3	19.4

Notes: Entries are stacked difference-in-differences estimates. The unit of observation is the NPI-year. Beneficiaries are attributed to providers on the basis of the plurality of standard office visits during the year. Baseline means are the mean for treated NPIs in 2016. Standard errors clustered at the NPI level are in parentheses.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A6: Effect of UnitedHealth Acquisition on Risk Scores

	Traditional Medicare	Medicare Advantage	UnitedHealthcare	Other Medicare Advantage
Panel A: Provider Level				
Effect	0.041***	0.074***	0.081***	0.068***
	(0.009)	(0.013)	(0.020)	(0.015)
NPI-Years	1,882,379	1,737,273	1,035,444	1,562,242
NPIs	340,186	331,571	225,449	304,586
Baseline mean	1.197	1.305	1.344	1.275
Panel B: Beneficiary Level with Beneficiary Fixed Effects				
Effect	0.019***	0.113***	0.058***	0.144***
	(0.005)	(0.010)	(0.013)	(0.013)
Beneficiary-Years	32,658,123	19,649,422	5,083,350	14,151,290
Baseline mean	1.110	1.252	1.219	1.264

Notes: Entries are stacked difference-in-differences estimates. In panel A, the unit of observation is the NPI-year. Risk scores are the mean risk score of attributed beneficiaries. Beneficiaries are attributed to providers on the basis of the plurality of standard office visits during the year. In Panel B, the unit of observation is the beneficiary-year. Panel B estimates also adjust for beneficiary fixed effects. Baseline means are the mean for treated NPIs in 2016. Standard errors clustered at the NPI level are in parentheses.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A7: Back-of-the-Envelope Estimates of the Effects on Federal Spending

	UnitedHealthcare	Other Medicare Advantage	Total
Number of Beneficiaries Seen by UnitedHealthcare Acquired Providers in 2022	0.081	0.068	–
Effect of Acquisitions on HCC Score	100,255	205,090	–
Beneficiaries × Effect × 12,000 (Million $)	97.4	167.4	264.8

Table A8: Effect of UnitedHealth Acquisition on Health Care Utilization

	Inpatient Admission	Emergency Department Visit
Panel A: Provider Level		
Effect	0.284	0.511
	(0.257)	(0.293)
NPI-Years	2,152,511	2,152,511
NPIs	385,017	385,017
Baseline Mean	19.5	29.3
Panel B: Beneficiary Level		
Effect	-0.000	0.002
	(0.001)	(0.001)
Beneficiary-Years	53,573,900	53,573,900
Baseline Mean	0.154	0.258

Notes: Entries are stacked difference-in-differences estimates. In panel A, the unit of observation is the NPI-year. The outcomes are the the share of beneficiaries–either in traditional Medicare or Medicare Advantage—who had an inpatient admission or an emergency department visit. Beneficiaries are attributed to providers on the basis of the plurality of standard office visits during the year. In Panel B, the unit of observation is the beneficiary-year. The outcomes are binary variables for whether the beneficiary had an inpatient admission or emergency department visit during the year. Panel B estimates also adjust for beneficiary fixed effects. Standard errors clustered at the NPI level are in parentheses.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A9: Robustness of the Effect of UnitedHealth Acquisitions

	(1)	(2)	(3)	(4)
	Main Model	Providers w/ patients in all 7 years	State Linear Trends	Physicians Only
Traditional Medicare Percent	0.010	-0.262	0.718	-0.064
	(0.367)	(0.372)	(0.371)	(0.422)
UnitedHealthcare Percent	0.907***	0.488	1.032***	1.070***
	(0.267)	(0.266)	(0.268)	(0.315)
Other Medicare Advantage Percent	-0.916**	-0.226	-1.751***	-1.006*
	(0.332)	(0.344)	(0.332)	(0.401)
Traditional Medicare Risk Score	0.041***	0.047***	0.033***	0.029**
	(0.009)	(0.009)	(0.010)	(0.011)
Medicare Advantage Risk Score	0.074***	0.080***	0.063***	0.067***
	(0.013)	(0.012)	(0.013)	(0.015)
UnitedHealthcare Risk Score	0.081***	0.080***	0.043*	0.040
	(0.020)	(0.021)	(0.020)	(0.021)
Other Medicare Advantage Risk Score	0.068***	0.067***	0.068***	0.077***
	(0.015)	(0.015)	(0.015)	(0.017)
Inpatient Admission	0.284	0.143	0.520*	0.493
	(0.257)	(0.212)	(0.262)	(0.287)
Emergency Department Visit	0.511	0.577*	0.670*	0.774*
	(0.293)	(0.257)	(0.297)	(0.323)

Notes: Each entry is a stacked difference-in-differences estimate from a separate regression. The unit of observation is the NPI-year. Each column indicates the sample/specification used for analysis. Standard errors clustered at the NPI level are in parentheses.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A10: Robustness of the Effect of UnitedHealth Acquisitions to Exclusion of Each Cohort

	Cohort Excluded					
	2017	2018	2019	2020	2021	2022
Traditional Medicare Percent	0.543	0.088	-0.180	-0.837	-0.015	0.027
	(0.406)	(0.379)	(0.400)	(0.552)	(0.368)	(0.371)
UnitedHealthcare Percent	0.504	0.576*	0.928**	2.290***	0.935***	0.909***
	(0.299)	(0.266)	(0.300)	(0.393)	(0.268)	(0.270)
Other Medicare Advantage Percent	-1.046**	-0.664	-0.748*	-1.453**	-0.920**	-0.936**
	(0.370)	(0.348)	(0.355)	(0.500)	(0.333)	(0.336)
Traditional Medicare Risk Score	0.027**	0.042***	0.046***	0.054***	0.041***	0.042***
	(0.010)	(0.010)	(0.011)	(0.013)	(0.009)	(0.010)
Medicare Advantage Risk Score	0.063***	0.070***	0.049**	0.138***	0.074***	0.075***
	(0.014)	(0.014)	(0.015)	(0.017)	(0.013)	(0.013)
UnitedHealthcare Risk Score	0.072***	0.080***	0.071**	0.114***	0.083***	0.083***
	(0.021)	(0.021)	(0.022)	(0.028)	(0.020)	(0.020)
Other Medicare Advantage Risk Score	0.058***	0.069***	0.049**	0.111***	0.068***	0.068***
	(0.016)	(0.015)	(0.017)	(0.019)	(0.015)	(0.015)
Inpatient Admissions	0.384	0.286	0.093	0.446	0.268	0.295
	(0.279)	(0.273)	(0.298)	(0.331)	(0.258)	(0.260)
Emergency Department Visit	0.438	0.529	0.231	1.078**	0.475	0.570
	(0.319)	(0.310)	(0.337)	(0.387)	(0.294)	(0.296)

Notes: Each entry is a stacked difference-in-differences estimate from a separate regression. The unit of observation is the NPI-year. Each column indicates the cohort that was excluded from analysis (both the NPIs acquired in that year and the never-acquired NPIs who were randomly assigned to that cohort). Standard errors clustered at the NPI level are in parentheses.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Appendix: Data Extraction Methodology and Identification of UnitedHealth/Optum's Subsidiaries.

We developed a process to identify physician practice groups that had been acquired by UnitedHealth Group between 2012 and 2023. Our approach combined two complementary data sources, SEC 10k filings and state insurance regulatory documents, to construct a list of affiliated Tax Identification Numbers (TINs). This multi-source strategy enabled us to capture both publicly disclosed subsidiaries and entities reported through regulatory channels.

1. Identification via SEC 10-K Filings

We developed a multi-step approach to extract TINs of UnitedHealth Group subsidiaries:

Step 1: Collection of subsidiary lists

We obtained lists of subsidiaries from Exhibit 22.1 of UnitedHealth's SEC 10-K filings for years 2012 through 2023. The Figure below shows a representative excerpt from Exhibit 22.1.

Step 2: Name matching to obtain organizational NPIs

We matched the subsidiary names from SEC filings to entities in the Trilliant Health database to obtain organizational National Provider Identifiers (NPIs). To ensure matching quality, we employed exact string matching rather than fuzzy matching algorithms.

Step 3: Cross-walking NPIs to TINs

We linked the organizational NPIs to their associated TINs using the Clarify database.

2. Extraction of TINs from state regulatory filings

Step 1: Collection of regulatory documents

We collected the filings that UnitedHealth submitted to the Department of Commerce and Insurance at Tennessee (`https://www.tn.gov/commerce/tenncare-oversight/reports/`

managed-care-organization-financial-reports.html) from 2012 to 2023.

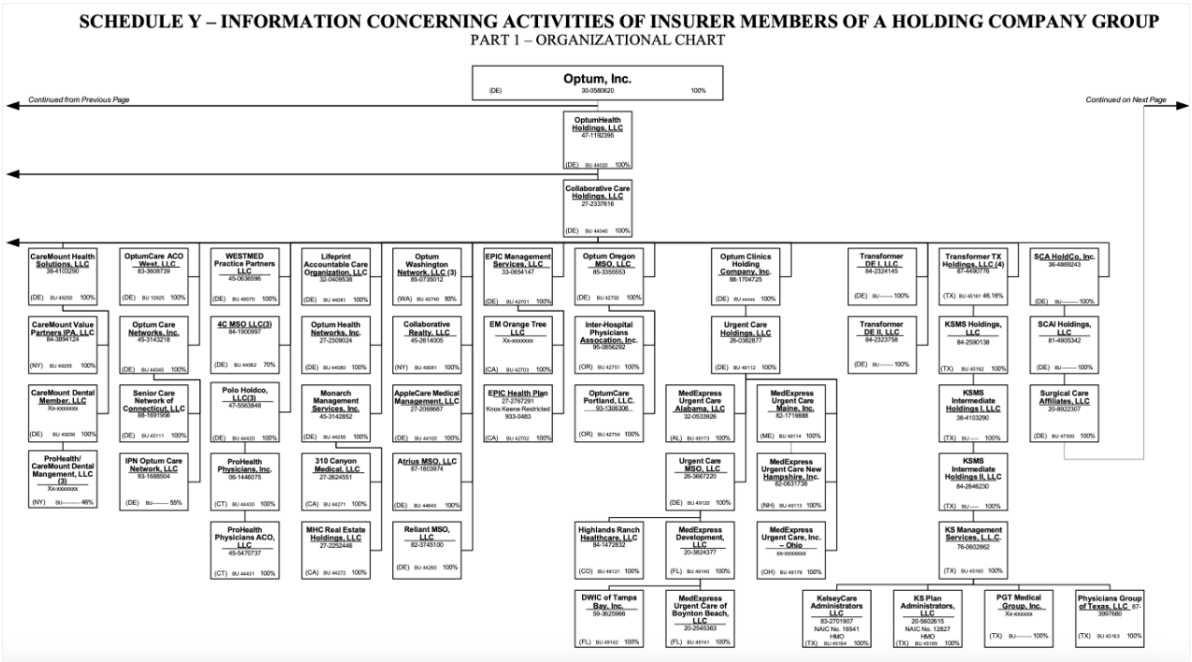
Step 2: OCR-based TIN extraction

We used the pytesseract python package to extract the TINs from Schedule Y Part 1 Organizational Chart via optical character recognition. The figure below shows one page of the chart.

3. Combination and harmonization

We merged the TIN sets identified from both data sources, removing duplicates and using acquisition dates from SEC 10-K filings as the primary temporal reference when discrepancies arose.

Figure A4: Subsidiary Structure of UnitedHealth



Notes: This figure shows an extract of Schedule Y from the Tennessee Department of Commerce and Insurance. Each cell contains an individual subsidiary, as well as the Tax Identification Number (TIN). We extract and aggregate TINs from Schedule Y forms on a quarterly basis.