Corporate Practice of Medicine: Vertical Alignment and Medicare Advantage Risk Coding

David J. Meyers, Jay Shroff, Yashaswini Singh, and Christopher Whaley*

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Abstract

A long-appreciated, but understudied, aspect of vertical integration is the ability to align incentives and enable coordination between principals and agents. We examine this dynamic in the context of vertical alignment between physicians and corporate primary care practices (CPCPs), which are often integrated with Medicare Advantage (MA) insurers. While concerns of increased coding intensity in MA are well-documented, the mechanisms that enable aggressive coding are less clear. Using hand-collected data on physician employment by CPCPs and national MA encounter data, we that find switching employment to a CPCP leads to an approximately 25% increase in MA risk score payments after 2 years and a 35% increase by 5 years. We find no evidence of increased health care utilization or an alternative risk score that uses pharmaceutical claims rather than recorded medical diagnoses. The increase in risk scores is driven by low-acuity and discretionary diagnoses. We estimate that higher risk-score payments due to integration lead to a $1.6 billion increase in annual payments from taxpayers to MA insurers.

Keywords: Medicare Advantage, risk score payments, principal-agent relationships, health care provider consolidation

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An important economic impact of vertical integration between firms is the ability to coordinate actions and align incentives (Bresnahan and Levin 2012). Yet, examples of how coordination across originally separate firms occurs are limited. At the same time, vertical integration, as with other forms of consolidation, can lead to increased consumer prices and market foreclosure (Ordover et al. 1990). While most studies of vertical integration focus on product prices and firm output, many firms sell products to markets, particularly those with a large government presence, in which prices are administratively determined and less likely to be directly impacted by market forces.[1] In these cases, coordination may indirectly manifest in the ways in which firms interact with purchasers, rather than direct changes in prices.

A relevant and important example that we study comes from the Medicare program in the United States, which provides health insurance to nearly 70 million primarily elderly individuals using a hybrid coverage model. Approximately half of Medicare beneficiaries are enrolled in "Traditional" Medicare, in which health insurance benefits are directly administered by the federal government. The other half enroll in Medicare Advantage (MA), in which private insurers administer benefits, but are subsidized by the government in a risk-based payment arrangement. These risk payments are based on the medical diagnoses submitted by the patient's provider. However, a long-recognized challenge is that the true illness severity is observed by neither the insurance plan nor the government, but is instead often at the discretion of the patient's physician (Cutler and Zeckhauser 2000). We study the opportunity to influence a physician's documentation of a patient's risk score as an example of vertical integration aligning incentives between physicians and MA plans.

[1] For example, payment for government contractors is often determined by negotiations. Many nations use formulaically determine pharmaceutical prices.

Both the role of risk-based payments in insurance market stability and the potential for "gaming" of risk-based payments are the focus of numerous studies and policy proposals. Several studies have found that risk scores in the Medicare Advantage program appear to be significantly higher than among beneficiaries of similar health status in Traditional Medicare (Geruso and Layton 2020; Curto et al. 2025; Kosar et al. 2024; Jacobs and Layton 2025; MedPAC 2025a). Most of these studies have focused on overall differences in risk scores, or the use of some plan-led tools to capture risk (James et al. 2024; Meyers and Trivedi 2021; Jacobs 2024). However, the mechanisms behind risk score gaming on the physician side have received less attention. Importantly, it is unclear why a physician who is responsible for medical coding would risk administrative time and hassle, reputational, and due to potential legal risks of billing fraud, financial costs of increased billing for the benefit of an insurer (Leder-Luis and Malani 2025). This mechanism is critical, as the "agent" responsible for determining and treating a patient's diagnoses, physicians, are commonly separate from the "principal" that benefits from increased coding intensity, the insurer (McGuire 2000).

Recent years have seen fundamental changes to many aspects of the organization of physician markets that may enable coordination on risk-based coding. These organizational changes may align the incentives of physicians to more intensely code with insurers, who benefit from increased coding intensity. In particular, over the last decade, many physicians are now employed by corporate owners, including insurers and investment-backed organizations. These organizations are often closely linked with, and in many cases, directly owned by, Medicare Advantage insurance companies. Insurers and proponents commonly argue that this form of integration can increase care coordination and align incentives to promote "value-based" care (Porter 2008).[2] However, it

[2] Value-based care is a set of reforms of the US healthcare system that typically describes shifts from fee-for-service based payment models which may be prone to overuse, to more capitated payment arrangements, that typically

can also align incentives to game risk-score payment measures. When independent, the physician operates as an agent primarily for the patient, but also for the Medicare program (i.e., the government) in determining and recording appropriate diagnoses. However, when employed by an insurer, there risks a potential that the physician's agency may shift to align with the incentives of the insurer when treating the patient and recording diagnoses. Importantly, while plans can provide some incentives to providers for additional risk score capture in the absence of integration, integrating with the physician potentially allows for seamless coordination around risk scores to solve this coordination problem. In this context, coordination around risk score coding can be enabled through both formal incentives, such as coding financial bonuses, as well as informal mechanisms, such as changes to electronic health record defaults. This shift in agency is not inconsequential for patients—Medicare beneficiaries can be denied access to alternative forms of coverage on the basis of pre-existing conditions, and inaccurate coding of diagnoses may present challenges for beneficiaries who want to switch plans (Meyers et al. 2019).

In this paper, we examine these questions by measuring changes in risk coding intensity following a physician's change in employment to a corporate primary care practice (CPCP). To do so, we leverage two unique sources of data. First, we collect unique data on physician employment by CPCP organizations. This process involves hand collected data on acquisitions of physician practices and administrative data on provider employment. From 2016 to 2022, the number of providers employed by a CPCP group in our sample increased from 681 to over 5,300. These integration events include both acquisitions by large publicly-traded insurers (e.g., UnitedHealth) as well as independent CPCP organizations that are strongly plan-aligned. We then

include restrictive budgeting and payment incentives for quality. Many efforts towards over the past several decades including the Medicare Advantage program and accountable care organizations were designed with value-based care in mind.

link these hand-collected data on primary care physician employment by CPCPs to Medicare Advantage encounter data. These data include detailed information on health care utilization patterns. We use the data on beneficiary-level diagnoses to calculate the HCC risk score used by Centers for Medicare and Medicaid Services (CMS) to determine payments to Medicare Advantage insurers for each beneficiary-provider pairing.

Using an event study framework, we find that following a physician's switch to a CPCP, the risk score for patients treated by a physician increases by approximately 25 percent after two years and 35 percent after five years of integration. We also find no evidence of pre-acquisition trends in patient risk scores or post-acquisition changes in patient composition. In additional tests, we find several substantial heterogeneity changes in risk score coding, including large differences across organizations. The largest increases are from Oakstreet Health and Centerwell, which each have over a 40 percent increase in risk scores.

Of course, one potential mechanism is that higher risk scores reflect actual increased treatment and patient care needs, rather than simply increased diagnostic coding intensity. If increased risk scores are due to increased medical care, then patients may benefit through improved health. If, however, increased risk scores are solely due to increased coding intensity or documentation of ancillary codes, then patients won't benefit from increased care, and increased risk scores will represent a transfer from the Medicare program to insurers. To test this mechanism, we conduct several tests of changes in medical care utilization. We find no significant changes in physician and inpatient visits, and a slight decrease in emergency department utilization. We also find an approximately 60 percent increase in the number of HCC risk codes attributed to a patient. This increase in diagnoses, which is not accompanied by changes in healthcare utilization indicative of higher health needs, suggests that the observed increase in risk scores is due to coding intensity.

We further find that increased coding intensity is driven by a mix of lower-acuity conditions in which a physician has more discretion to diagnose, such as depression, and conditions where significant concerns have been raised about faulty diagnosing (i.e., vascular disease)[3] rather than higher-acuity or more stark conditions, such as hip fractures and cancer. We also find substitution away from low complexity conditions (e.g., diabetes without complication) and towards high-complexity conditions (e.g., diabetes with complication).[4]

Additionally, we test for changes in underlying health status using the Johns Hopkins ACG pharmaceutical risk score measure. Like other risk score measures, the ACG risk score is designed to predict future medical utilization and spending and has been used in other settings to measure patient health risks (Handel 2013) and to benchmark differences in MA risk inflation (Jacobs and Kronick 2021). Importantly, it is distinct from the HCC model used by CMS to determine payments to Medicare Advantage insurers. We further use the version of the ACG based on just prescription drug claims, rather than medical diagnoses. If increased HCC scores are due to increases in patient illness burden, then it is likely that these same care needs would be reflected in increased pharmaceutical drug utilization. However, we find *no change* in drug-based ACG risk scores. This finding further suggests that increases in HCC scores used to determine MA payment are driven by increased medical coding intensity, rather than increased patient illness.

Overall, our results point to a marked increase in risk scores following vertical affiliation of primary care physicians with health insurers. This increase in risk scores leads to an approximately $4,200 per member per year increase in Medicare payments to insurers collectively leading to an

[3] There has been signifciant reporting that conditions such as vascular disease may be inflating risk codes substantially for the MA program through the use of a device called QuantaFlo that diagnoses vascular disease in patients that are otherwise not symptomatic of disease. See https://www.wsj.com/health/healthcare/medicare-extra-payments-home-visits-diagnosis-057dca8b

[4] In particular, we find a symmetric and same-sized magnitude decrease in diabetes without complications and increase in diabetes with complications.

annual $1.6 billion increase in Medicare payments to insurers, approximately 0.5 percent of all Medicare Advantage spending. Our findings are consistent with vertical integration enabling coordination between insurers and physicians that would not have existed without this formal linkage, and this coordination enabling a large financial surplus to insurers.

Overall, our results contribute to several literatures. First, we contribute to a growing literature on the impacts of MA on health care spending, and whether MA plans are more efficient than Traditional Medicare. These studies find evidence of advantageous selection of healthier individuals, which accounts for modest increases in MA payments relative to comparable TM enrollees (Curto et al. 2019). More recent studies find evidence of increased payments to MA plans due to more aggressive coding (Meyers and Trivedi 2021; Murray et al. 2024). An important contributor to differences in payments between MA and FFS are potentially upcoded risk adjusted payments in Medicare Advantage, resulting in billions in higher public spending in the United States (Meyers and Trivedi 2021; Murrin 2021). However, these studies do not examine the underlying mechanisms that lead to increased coding intensity. Our study is most closely related to Geruso and Layton (2020), who exploit geographic shocks to MA plans and find increased coding intensity among MA plans, and even higher intensity among provider-owned MA plans. Our paper extends this research by providing a within-MA estimate of upcoding and by focusing on provider switching to a MA-aligned or owned practice. We also bring improved data on provider affiliation from an emerging source of provider consolidation. Additionally, our set of alternative tests supports the idea that the observed increase in risk coding intensity is due to upcoding, rather than changes in patient care needs.

We also contribute to a more general literature on the role of risk scores in determining insurance payments. As summarized in Geruso and Layton (2017), much of the existing research

on risk adjustment has focused on issues around the influence of risk scores on consumer or firm choice coverage decisions and the role of risk adjustment in stabilizing insurance pools (Rothschild and Stiglitz 1978). However, few studies have examined the impacts of *ex-post* manipulation of risk scores by once plan selections are made. Relatedly, we contribute to the literature on physician agency, which has largely focused on treatment decisions made by providers (McGuire 2000; Gruber and Owings 1996). Researchers have long recognized that through discretion over patient diagnoses, provider incentives are an important mechanism for upcoding (Dafny 2005; Crespin et al. 2024). More recent studies examine the role of physician agency and financial incentives in determining choice of facility location (Munnich et al. 2020). We extend this literature by examining how insurer incentives can influence physician billing behavior and how consolidation enables alignment of physician and insurer incentives.

Finally, we contribute to a growing literature on how financial incentives are both a cause and consequence of physician market consolidation. Much of this literature has examined hospital-physician vertical integration, where the financial opportunities are to leverage "site-of-care" payment differentials and shift referrals to acquiring hospitals. Several studies document that physicians respond to these incentives and change referral patterns following hospital-driven vertical integration (Baker et al. 2016; Alpert et al. 2017; Whaley and Zhao 2024; Cooper et al. 2025). More recent work examines a similarly-emerging form of physician consolidation driven by private equity firm acquisition of physician practices, and finds meaningful increases in prices negotiated with insurers (Singh et al. 2022; La Forgia et al. 2022; Asil et al. 2024). Also closely related to our study is Gray et al. (2023), which finds MA insurer and pharmacy benefit manager integration leads to increased premiums for rival MA plans.

The rest of the paper proceeds as follows. We first provide an overview of Medicare Advantage and the recent emergence of corporate primary care practices. We then describe our data and empirical approach. Next, we present our main results, additional robustness tests and empirical tests that examine mechanisms. We then conclude.

2 Background on Medicare Advantage and Corporate Primary Care Practices

Growth in Medicare Advantage

Medicare Advantage (MA), an alternative to traditional Medicare, has experienced substantial growth over the last two decades. Enrollment in MA—private insurance plans for Medicare beneficiaries—has grown rapidly, from 25 percent of beneficiaries in 2010 to 54 percent (33.8 million enrollees) in 2024.[5] MA plans are funded through a capitated payment system, meaning that the federal government pays private insurers a fixed, per-member, per-month amount to cover each enrollee. This amount is intended to reflect the estimated costs of caring for individuals based on their health status and demographics, rather than on actual medical expenses. Payments to Medicare Advantage plans vary based on benchmarks set at the county level, adjusted annually, and modified by a risk adjustment model to more accurately align payments with enrollees' healthcare needs.

There are several primary differences between Medicare Advantage and traditional Medicare. Medicare Advantage plans may offer additional benefits that are not available in Traditional Medicare such as dental and vision coverage. To control spending, Medicare Advantage plans can

[5] Source: Kaiser Family Foundation https://www.kff.org/medicare/issue-brief/medicare-advantage-in-2024-enrollment-update-and-key-trends/

employ narrow networks of providers and use prior authorization for services, whereas these restrictions don't exist in Traditional Medicare. Enrollees have wide choice of individual MA plan options. Several studies examine the consistency of these choices and the impacts of individual plan choice (Afendulis et al. 2015; Han and Lavetti 2017; Abaluck et al. 2021).

Prior work on the program has found mixed success in it's ability to constrain spending. Studies find relatively slightly lower patient care utilization patterns between MA and FFS (Curto et al. 2019; Brot et al. 2025), with the most reductions in utilization for potentially costly post-acute and long term care (Jung et al. 2018; Ma et al. 2024). However, recent evidence has found that differences in outcomes and utilization may be shrinking over time as the program continues to grow and is not as successfully selecting for healthier beneficiaries (Landon et al. 2022). Despite potential increases in efficiency by MA plans, at no point in the program's history has spending been lower per beneficiary in the Medicare Advantage program relative to Traditional Medicare. The Medicare Payment Advisory Commission (MedPAC) estimates that MA plans are paid on average 20% more for each MA beneficiary compared to an average TM enroll, and that this difference in payment has grown from $21 billion a year in 2016 to over $84 billion a year in 2025 (MedPAC 2025b). The key drivers of this overpayment are selection, and risk adjustment, which is the focus of this paper.

Medicare Advantage Risk Score Payments

All patients enrolled in MA are assigned a risk score based on the patient's observed medical diagnoses as captured using Medicare Advantage encounter data. The Hierarchical Condition Category (HCC) model is the primary tool Medicare uses to calculate risk scores and adjust payments for Medicare Advantage enrollees to ensure that plans with sicker populations receive

higher payments. Developed by CMS, the HCC model assigns scores to each beneficiary based on their demographic information (age, gender, Medicaid eligibility) and documented medical conditions and diagnosis codes. Under the current model, approximately 10,000 diagnosis codes map onto 86 HCCs in 19 distinct categories. Each condition correlates with an associated risk score or "weight" that reflects the expected cost of care. The model is trained based on spending in the Traditional Medicare program and then applied to Medicare Advantage. Higher risk scores indicate a greater expected cost, translating to higher payments to the MA plan.

A growing policy concern is that the HCC model creates financial incentives for MA insurers to aggressively code beneficiaries' health status to make them appear to have additional illnesses and other conditions that would command higher payment. This occurrence, referred to as "upcoding," inflates risk scores and ultimately drive higher reimbursement to MA plans without beneficiaries receiving care for those diagnoses. The Office of Inspector General (OIG), CMS, the United States Department of Justice (DOJ), the Government Accountability Office (GAO), and the Medicare Payment Advisory Commission (MedPAC) have expressed concern related to MA companies' inflating their beneficiaries' risk scores. Past work on switchers from Traditional Medicare to Medicare Advantage has found that enrollment in MA leads to about an 18% increase in risk scores (Jacobs and Layton 2025). Research has also documented that MA companies differentially code more intensely than the Traditional Medicare program, resulting in risk adjusted payments being a potential source of overpayments in the MA program (James et al. 2024; Jacobs and Kronick 2018). Yet, causal empirical evidence of the underlying mechanisms behind increased coding intensity is limited.

Trends in Corporate Primary Care Providers

The growth in MA and related value-based payment programs has spurred corporate interest, including from private equity firms and health insurers, in physician practices, aiming to provide investments to facilitate coordinated and comprehensive care. This trend is most notable within primary care, given primary care physicians hold information on patient medical history, informally coordinate care, and in many cases, formally manage access to specialists through referrals.

The growth of corporate primary care practices (CPCPs) has been supported predominantly by risk-based payment arrangements in MA. While data on new entrants in primary care is lacking, media reports suggest that CPCPs take the form of joint ventures between private equity firms and health insurers. For example, CPCPs include Oak Street Health, a network of primary care centers with investments from private equity firm General Atlantic and Humana that had an IPO in 2020 (eventually sold to CVS Health for $10.6 billion in 2023), Iora Health, a primary care platform with investments from PE investors and Humana (eventually sold to One Medical for $2.1 billion in 2021),[6] CenterWell Senior Primary Care (a joint venture of Humana with PE firm Welsh, Carson, Anderson & Stowe), OptumCare (an affiliate of UnitedHealth Group).

While a majority of CPCPs exclusively care for older adults in Medicare, particularly Medicare Advantage (and are thus marketed as "senior-focused value-based primary care"), a smaller group of CPCPs target the commercial population. The commercial-focused CPCPs are comparable to concierge medicine, generally charging a flat per-employee-per-month fee to prioritize patient access to same-day appointments. An example of this trend is 1Life Healthcare (One Medical), which was acquired by Amazon for $3.9 billion in 2023.

[6] Additional information in Iora's expansion into MA populations is here: https://www.businessinsider.com/iora-health-raising-money-for-new-primary-care-model-2019-10

3 Data

Corporate Primary Care Practice Employment Data

Despite the growth and interest in CPCPs, data on physicians who work for these organizations is not readily available. We compiled a hand-collected dataset on physician employment by CPCPs by linking novel affiliation data to the Medicare Data on Provider Practice and Specialty (MD-PPAS) from 2016-2022.

To do so, we first identified the target business name of CPCPs, along with variations of the legal business name, through internet searches, SEC filings, etc. We identified CPCPs that represent senior-focused primary care organizations. Next, we used partial or full string-matching techniques to link the TIN legal business name to the target business name. We limited the MD-PPAS data to only primary care clinicians based on physician specialty codes.[7] Our set of CPCPs, as well as our control population, includes both physicians, as well as advanced-practice nurses and physician assistants who provide direct patient care.

Our treatment group is defined as providers who switch affiliation from a non-CPCP TIN to a CPCP TIN from one year to the next, over the 2017 to 2022 period. Providers who switch in 2016 are "always treated" and thus excluded. We also separately identify two control groups. First, a standard control group of PCP providers who never change affiliation during this period. Second, we identify providers who switch affiliation from a non-CPCP TIN to another non-CPCP TIN. This secondary control group allows us to estimate the effects of changing provider organizations that may be separate from CPCP incentives. For example, changing organizations may involve

[7] The specific practitioner specialty codes are family practice, general practice, geriatric medicine, internal medicine, nurse practitioner, obstetrics and gynecology, pediatric medicine, physician assistant, and preventive medicine.

new electronic health record or other technology platforms or increased new-patient visits that result in higher coding intensity. The switches themselves likely take one of two forms- either an individual providers who is choosing to change their enrollment from one practice or another, or cases when an entire practice is acquired by a CPCP entity, although we are unable to differentiate between the two.

Figure 1 shows annual trends in the identified set of treatment of providers (Panel A) who switch to a CPCP and the Medicare Advantage beneficiaries in our 20% MA sample that they treat (Panel B). In 2017, the first year of our study period, we identified 681 providers (NPIs) and 5863 MA beneficiaries. These numbers increased to 5349 and 73,120 in 2022.

Figure 2 shows geographic distribution in both the number of and growth of CPCPs by state. We find large geographic differences in both the number of CPCPs and growth in CPCPs by state. In both absolute and growth terms, the largest concentration of CPCPs are in Florida and Texas. Further supporting the link between CPCPs and MA, these two states are also the markets in which Medicare Advantage enrollment has increased the most.

Medicare Advantage Encounter Data

We link the data on provider switching events to a 20% random national sample of Medicare Advantage encounter data over the 2016 to 2022 period. Similar to claims data, these data include detailed information on patient diagnoses, procedures performed, and provider information. However, unlike most claims data sources, the encounter data do not include information on prices negotiated between MA insurers and providers. The encounter data are the primary source of diagnoses for risk adjustment, so they provide a complete picture of risk score differences between beneficiaries.

We use these data to construct our primary outcome measure of beneficiary-level HCC scores. The HCC scores account for all diagnoses received by a beneficiary. We construct several measures of beneficiary HCC scores. In our main analysis, we consider only the diagnoses coded by a given provider, identified using the provider's National Provider Identifier (NPI). To account for broader patterns of care and to examine differences based on baseline differences, we also measure a beneficiary's annual HCC score across all providers. To calculate HCC scores, we use CMS software that ingests diagnoses codes from the encounter data and calculates respective risk scores.[8] The weights that each chronic condition attribute to a beneficiary's HCC score change over time. To avoid differences due to changes in the broader HCC model, we use the V24 version of the HCC model consistently over time. For additional outcomes, we also use the encounter data to calculate beneficiary-level measures of medical utilization, including hospitalizations.

Beneficiary-Primary Care Provider Attribution

We measure changes in a given beneficiary's HCC score following the switch of that beneficiary's primary care provider to a CPCP. A key step is to attribute beneficiaries to the appropriate PCP and then measure changes in that PCP's affiliation. We attribute each MA beneficiary to a PCP using existing approaches that measure the share of primary care evaluation and management (E&M) visits delivered by each clinician to a given beneficiary. We follow Whaley and Zhao (2024) and attribute each beneficiary to the PCP with the plurality of visits. In cases of ties, we randomly attribute a beneficiary to a break the tie. This approach follows that used in other payment models, such as Medicare accountable care organizations (ACOs).

[8] CMS HCC software: https://www.cms.gov/medicare/health-plans/medicareadvtgspecratestats/risk-adjustors/2024-model-software/icd-10-mappings

4 Empirical Approach

Our empirical approach is to estimate the effect a provider switching to a CPCP on the MA risk scores for that provider's patients. To do so, we follow the approach used by several other studies that examine the impact of changes in physician markets and use a generalized difference-in-differences approach. In particular, we estimate event studies that estimate changes in HCC risk scores for patient i in year t attributed to physician p in the years before and after that physician switches to a CPCP, using the following specification:

$$HCC_{ipt} = \alpha + \sum_{j} \beta_j \cdot D_{p,t-j} + \omega_i + \delta_t + \pi_p + \varepsilon_{pt} \quad (1)$$

In this model, the set of β_j coefficients represent the differential change in HCC scores relative to the year of switch, D, relative to our reference period of the year prior to switch. We include fixed effects for beneficiary (ω_i), year (δ_t), provider (π_p). The beneficiary fixed effects control for unobserved patient-level factors that may influence risk scores (e.g., health preferences, access to care, socioeconomic status). Likewise, the provider-level fixed effects control for time-invariant provider diagnosing and coding patterns.

Due to concerns about staggered treatment timing and treatment effect heterogeneity, we estimate these event studies using a dynamic treatment effect estimator (Sun and Abraham 2020). For the "never switch" control group, we randomly assign a placebo switch date, similar to a "stacked" event study approach (Cengiz et al. 2019). We cluster standard errors at the provider (NPI) level.

Our inclusion of both beneficiary and attributed provider fixed effects means that we are estimating the *within-patient* and *within-provider* change in HCCs following a provider switching to a CPCP. Importantly, our main analysis does not restrict to the within-beneficiary and provider pairing. In other words, our main analysis allows for a patient to switch providers following a provider switching to a CPCP. We do so to allow for observed switches between beneficiaries and providers following a CPCP switch.

To address the potential concerns from this approach, we conduct additional tests. First, we examine changes in the composition of beneficiaries attributed to a PCP following a switch to a CPCP, including mean patient age, gender, and the number of attributed patients. Finding changes in patient composition directly suggests patient selection. Second, we interact the beneficiary and provider fixed effects (e.g., $\omega_i \times \pi_p$). Including the interaction of the two fixed effects estimates the within-beneficiary and provider pair change in HCC scores following the provider's switch to a CPCP. Finally, we fully balance the panel to limit the sample to beneficiaries attributed to the same PCP over the entire sample. This restriction eliminates potential bias due to patient selection in or out of a PCP's panel following switch to a CPCP.

Our empirical approach relies on several assumptions. First, as with other difference-in-differences evaluations, we assume that no contemporaneous shocks occur at the time of provider switching. We test this assumption by examining pre-switch trends in integration in our event studies. We also use the Honest DID approach to test the robustness of our findings to any violations (Rambachan and Roth 2023). As noted above, we also examine changes in attributed patient characteristics and test for potential unobserved patient selection effects.

A related concern is that provider switching is endogenous or contemporaneous with other changes that impact provider risk coding. Endogenous provider selection into CPCPs is likely to

be at least partially reflected into our event studies. We conduct several tests that examine the potential threats due to endogenous provider switching. First, we directly measure changes in the number of MA beneficiaries attributed to each physician. Second, in addition to estimating changes in HCCs, we also estimate changes in observable patient characteristics (e.g., patient age, gender) following switching. We find a small increase in attributed beneficiaries and no changes in patient composition.

Second, changes in HCCs may be mechanically linked to increased health care utilization or diagnoses that follows a provider switching to a new organization. As a sensitivity test, we estimate the effects of an alternative form of physician integration—physician hospital vertical integration. The general switching effects, rather than insurer-specific incentives, are likely to equally impact hospital-physician integration.

In addition, our main analysis examines HCC scores tied to diagnoses of beneficiary conditions. It is possible that overall care delivery increases following provider switching or integration with an insurer. In such a case, it is unclear if any observed increase in HCC codes represents "upcoding" or overall improvements in patient care, which may be beneficial to beneficiary health. We estimate changes in overall health care utilization following a switch to test this. To further test for changes in patient utilization, we use an alternative risk score, the ACG risk score model, which is based off of prescription drug utilization. If increased risk scores reflect higher health needs and utilization, then presumably these needs will also be reflected in medication use.

5 Results

Changes in HCC risk coding following CPCP affiliation

Figure 3 presents our main event study results that measure changes in within-beneficiary HCC risk scores following a provider switching to a CPCP. Prior to a provider switching to a CPCP, we see small changes in beneficiary risk scores that are nosily centered around 0. Following a provider switch, there is an immediate and steady increase in HCC risk scores. By the two years post-switch we see a 0.25-unit increase in HCC scores. By five years following a switch we see a 0.36-unit increase in risk scores. Because HCC scores are normalized to mean 1.0, the observed increase translates to a 25 to 36 percent increase in risk scores following a provider switch to a CPCP.

This result is robust to alternative specifications, including propensity score matching switching providers, including beneficiary-patient fixed effect interactions, and attributing patients to providers (Appendix 1).

To place these results in context, the "baseline" payment per beneficiary upon which Medicare Advantage payments are based is approximately $12,000. Under the MA payment model, a patient's HCC risk score is multiplied by the baseline payment rate to determine payment from CMS to the patient's MA plan. Thus, the 35 percent increase in HCC risk score translates to a $4,200 mean increase in CMS payments to MA insurers per beneficiary. In our analytic sample, a total of 75,000 MA beneficiaries are attributed to a CPCP. Because our analytic sample is derived from a random 20% sample of MA encounter data, the national number of impacted beneficiaries is approximately 375,000. Thus, our results imply an annual $1.58 billion increase in Medicare

spending among patients receiving care from CPCPs alone. This increase in spending translates to about 0.5 percent of total annual Medicare Advantage spending.[9]

Heterogeneous changes in HCC risk scores

Our main results focus on mean changes in risk scores following vertical integration. However, these mean results may mask important layers of heterogeneity. To examine heterogeneous effects, we implement two approaches. First, we apply the same empirical approach as Equation 1 but estimate separate regressions for each CPCP organization. This allows us to test for organizational heterogeneity in risk coding intensity. The results in Figure 4 show a wide range of treatment effects across firms. On the high end, we observe over a 0.5-unit increase in HCC scores for Centerwell and Oak Street. These models include beneficiary fixed effects, and thus represent a 50 percent *within-patient* increase in risk scores following affiliation changes. Further highlighting the potential role of CPCPs enabling risk score coding coordination with insurers, following its 2020 IPO, Oak Street was sold to CVS/Aetna for nearly $11 billion in 2023. CenterWell likewise is owned by Humana.

Our second approach examines heterogeneity based on differences in patient illness burdens. From a policy perspective, finding an approximately across-the-board increase in risk scores (e.g., all beneficiaries increase by 10 percent) has substantially different implications and potential responses than finding a larger and more concentrated increase among a smaller population subset. Even in the concentrated score increase, it is immediately obvious where in the distribution of patient illness burden the risk score increases.

[9] CBO Estimates of total Medicare Advantage spending: https://www.cbo.gov/system/files/2024-06/51302-2024-06-medicare.pdf

To examine patient-level heterogeneity, we examine differences in changes in beneficiary-level HCC scores following a beneficiary's primary care provider switching to a CPCP based on the pre-switch distribution of baseline HCC scores. We use the year prior to switching (and the placebo switch year for the main control group) to establish baseline HCC score and divide the distribution of beneficiary HCC scores into four quartiles, with the bottom quartile representing patients with the lowest HCC score and the top quartile representing those with the highest HCC score. We estimate separate event studies (equation 1) for each quartile of baseline HCC scores.

As seen in Figure 5, we find the largest change in HCC scores is among beneficiaries who already had HCC higher scores, with the smallest absolute changes among those with the lowest baseline HCC scores.

6 Robustness Tests

Changes in patient panel characteristics

As discussed above, the validity of our core results has several potential threats, which we attempt to address in a series of sensitivity tests. A primary concern is changes to a physician's patient panel following integration. This concern is particularly relevant given the incentive for insurers to "cherry pick" and select healthier patient populations. Existing studies document how insurer networks contribute to advantageous risk selection (Shepard 2022). We estimate similar event studies, but replace our HCC outcome with measures of patient observable characteristics. As shown in Figure 6, we see no change in attributed patient age, or gender following integration. Thus, it does not appear that physician vertical integration with insurers changes the composition of treated patients and thereby contributes to changes in patient risk scores. We see a slight increase

in the number of attributed beneficiaries per provider after attribution, but attribution rates are fairly stable. (Appendix Figure 2)

Appendix Figure 1 presents the event study results where we iteratively add fixed effects, including provider-beneficiary interacted fixed effects. Even with the interacted fixed effects included, we still see similar trends in terms of risk score growth. Likewise, Appendix Figure 3 presents results that restrict the analytic sample to consistent provider-beneficiary pairings over the entire seven-year period. This restriction most directly limits concerns of patients switching to a new primary care provider following a provider switch to a CPCP. Even with this restrictive sample, we find similar, and slightly larger, changes in HCC as our main specification.

Changes in healthcare utilization

HCC risk scores are determined by underlying patient billing records. If providers more aggressively document billing or potentially inappropriately assign diagnosis, then risk score increases may be a case of "upcoding" or fraudulent billing behavior. If, however, risk scores are reflective of increased patient care, then the welfare effects are less clear. Patients may benefit from improved medical care, even if Medicare spending and payments to MA insurers increases. At the same time, increases in "low-value" care could indicate that higher care management, a purported aim of CPCPs, is not being met.

We examine these mechanisms by estimating the effect of physician CPCP affiliation on several measures of medical utilization, including emergency department visits, inpatient hospitalizations, and office visits. In particular, both ED and hospitalization measures are indicative of higher health needs and utilization. Figure 7 shows that in general there were no significant changes in utilization, but modest decreases in emergency department utilization. While

office visits and inpatient visits trended upwards, the effect sizes are small and not statistically significant in most years, indicating few changes in utilization to go along with the larger captured HCC scores.

Regression model robustness and alternative forms of physician consolidation

In additional sensitivity analysis in Appendix Figure 4, we present the results from our HonestDiD testing. We find that our results are robust to parallel trend violations that are approximately 75 percent larger than our observed pre-trends.

A more general concern is that a physician switching organizations may be tied to other changes in performance inherent to a new practice environment. For example, patients may require additional "new patient" visits or new electronic health records may require additional coding input. We test for this potential effect by examining the changes in HCC scores following an alternative form of consolidation—hospital-physician vertical integration.

In Appendix Figure 5, we present the of an alternative specification where we compare the HCC effects of switching to work for a hospital owned physician organization rather than a CPCP. We determined which providers were affiliated with hospital owned health systems using the AHRQ compendium. Given that the compendium was not available as an annual file during all years of our study, we are limited to a shorter pre- and post- trends window for this analysis. We find that switching to a hospital owned physician practice appears to be associated with a slight *decrease* in risk scores, which is in contrast to our main result of a substantial increase. However, the pre-trends are likely a violation and the overall effect size is substantially smaller than our primary analysis. This finding suggests that switching to a CPCP is a very different phenomena

and the large increase in HCC scores we observe is not due simply to broader changes in practice environment.

Changes in alternative risk score measure

We also examine changes in beneficiary risk using an alternative risk score measure, the ACG pharmaceutical risk score algorithm developed by Johns Hopkins to measure patient-level health care utilization and spending. As discussed above, this risk score measure uses pharmaceutical claims data, rather than diagnosis codes, to estimate future patient health care spending and utilization. Importantly, the ACG score is distinct from HCC scores as it is not used to determine payments to Medicare Advantage insurers, and as a result, should not be affected similarly by incentives to upcode. Conceptually, higher health needs reflected in increased HCC scores should also lead to increased prescription drug utilization, particularly for chronic conditions.

However, we find no change in ACG risk scores following a switch to a CPCP (Figure 8), which is contrast to our main results, where we find large increases in HCC risk scores. This result implies that the HCC scores increased independently of a patient's chronic disease burden as measured by their use of pharmaceutical medications. An alternative explanation is that patients may be using fewer pharmaceutical prescriptions following a switch to CPCPs, which could alternatively be a poor quality indicator for these providers.

7 Mechanism: Increases in Number of Diagnosis Codes and Low-Acuity Diagnoses

We next explore the underlying mechanisms behind increases in HCC scores. We first estimate the beneficiary-level changes in the number HCC codes, rather than HCC risk scores. HCC risk

scores are determined through summing a beneficiary's HCC code weights for individual HCC codes. Thus, this test examines changes in the count of a beneficiary's HCC codes following their primary care provider joining a CPCP. As reported in Figure 9, we find an approximately 2-unit increase in the number of individual diagnosis codes (Panel A). Based on the baseline mean of 6.6 diagnosis codes translates into an approximately 30% increase in the number of diagnosis codes. The event study results in Panel B roll individual diagnoses into HCC codes, where we find an approximately 0.8-unit increase in the number of HCC codes assigned to a beneficiary. The mean number of HCC codes in our sample is 1.18. Thus, the number of HCC codes that contribute to a patient's HCC risk score expands by approximately 67 percent.

While this test shows an increase in diagnosis intensity, it does not show where increases are coming from and the codes that contribute to increased diagnoses. Understanding these differences is important for both understanding the mechanisms of increased coding intensity, as well as informing policy responses. To do so, we leverage the scope of the data and estimate changes in each of the 86 HCC codes following a provider switching to a CPCP. For each HCC code k, we estimate a separate regression of equation (1) for that code. Due to the large number of HCC codes, we estimate a "two-by-two" difference-in-difference regression, rather than full event studies. We likewise estimate using the Sun-Abraham estimator.

$$HCC_{iptk} = \alpha + \beta_k D_{pt} + \omega_i + \delta_t + \pi_p + \varepsilon_{pt} \quad (2)$$

Here, D_{pt} represents the switch timing of each primary care provider (j). We recover a vector of estimated changes in the use of each HCC (β_k), which collectively denote the change in the use of each individual HCC code. This test allows us to examine changes in use of individual HCCs,

across the full set of HCCs. Across all HCCs, conditions also vary by the ability of regulators to monitor a patient's true diagnosis vs. those in which a treating physician has more leeway to diagnose. For example, mis-diagnosing a patient with a heart attack or cancer will be easier for regulators to detect than a mental health or low-acuity diagnosis. Despite the lower HCC weight for low-acuity and more discretionary diagnosis codes, there may be more pressure to increase these types of codes vs. more complex or less discretionary codes, which, despite higher HCC payment weights, are easier to detect inappropriate coding.

The results in Figure 10 focus on the 15 codes with the largest increases (Panel A) and decreases (Panel B). We find that HCCs with the largest increases are for lower-acuity and more discretionary codes. Particularly, we find the largest increases for vascular disease and congestive heart failure. We also find increases in moderate chronic kidney disease and mental health conditions. We find increases, albeit smaller, for circulatory and pulmonary conditions. On the other hand, we find the largest decreases in acute and severe conditions. Particularly notable is the decrease in diabetes *without* complications, which nearly offsets the increase in diabetes with complication. This finding suggests substitution within patient diagnoses across disease severity.[10]

These results suggest the notable increase in the number of HCC risk scores, which leads to increases in HCC risk scores, is driven by lower-acuity diagnoses that are less likely to be observable and conflicting opinions by regulators and coding monitors. We also find evidence that within a condition, CPCP providers are more likely to code a patient as high vs. low complexity. This pattern is consistent with observed upcoding behavior in the Medicare DRG payment model for inpatient hospitalizations (Dafny 2005; Crespin et al. 2024).

[10] Notably, the V28 version of the HCC risk score model is designed to limit the impacts of these forms of substitution by reducing the number of severity options within a disease category.

8 Discussion

A long-appreciated feature of vertical integration is the ability to formally coordinate behavior across firms (Bresnahan and Levin 2012). We examine this question in the context of physician practices that are aligned with, and in some cases, owned by, Medicare Advantage insurers. MA insurers are paid based on a per-beneficiary risk score, raising the potential that coordination may align incentives between the provider to more intensely code a patient, and a MA plan, which receives additional payment as a result of increased risk coding. This coordination has contributed to concerns raised by the Government Accountability Office and other regulatory bodies on the appropriate use of risk adjustment models to allocate the nearly $500 billion in annual MA payments.

Consistent with this concern, we find that when providers switch their affiliation to CPCPs, corporate primary care practices with strong vertical ties with Medicare Advantage plans, that there is a 25 to 35 percent increase in risk scores, contributing to $1.6 billion in additional Medicare spending. Our results are robust to alternative specifications, driven by conditions in which a physician has more discretion to diagnose, and not associated with other significant changes in patient composition, health status, or utilization.

Importantly, increases in risk scores associated with CPCPs does not necessarily mean that increased coding is fraudulent. Many patients, including those in our study population, likely have under diagnoses of certain conditions and increased MA coding may be due to under-coding in Traditional Medicare (Ghoshal-Datta et al. 2024). However, in vertically aligned arrangements, the coordination problem of coding capture is largely solved, allowing for potentially large increases in payments to some insurers and providers, that other less integrated providers and insurers are not able to compete with. Linking physicians to CPCPs that are closely affiliated to an

insurer, allows the physician to operate as a more-aligned agent for their new principal, the MA insurer.

Currently, CMS has no ability to regulate the role that CPCPs are playing in the MA program. There are no national datasets of CPCPs and vertically integrated providers, thus why we needed to hand-code the data to conduct this work. There are also potential concerns over CMS's ability to identify if any of this coding behavior is fraudulent. Currently, CMS uses the Risk Adjustment Data Validation (RADV) audit system to audit plan-submitted HCC scores. RADV audits include comparing risk codes reported by plans to those that are included in a patient's medical record.[11] In CPCP and other vertically integrated arrangements, there is likely less distance between the codes captured in a health record and a plan, limiting the ability for the audits to detect meaningful differences. This again creates challenges for the overall MA market, as some insurers have the means to engage in these behaviors while other insurers may not have the means to do so and are thus unable to compete.

Historically, providers were independent actors that served as agents to patients in the healthcare system. With the rapid expansion of Medicare Advantage and vertical integration, providers may no longer have the same level of independence, raising concerns for the current Medicare payment system and for patients.

[11] The ability of CMS to expand RADV audits has been legally contested by many MA plans. A recent federal district court judgement limits the ability of CMS to expand or apply retroactively RADV audits (*HUMANA INC. v. XAVIER BECERRA* 2025).

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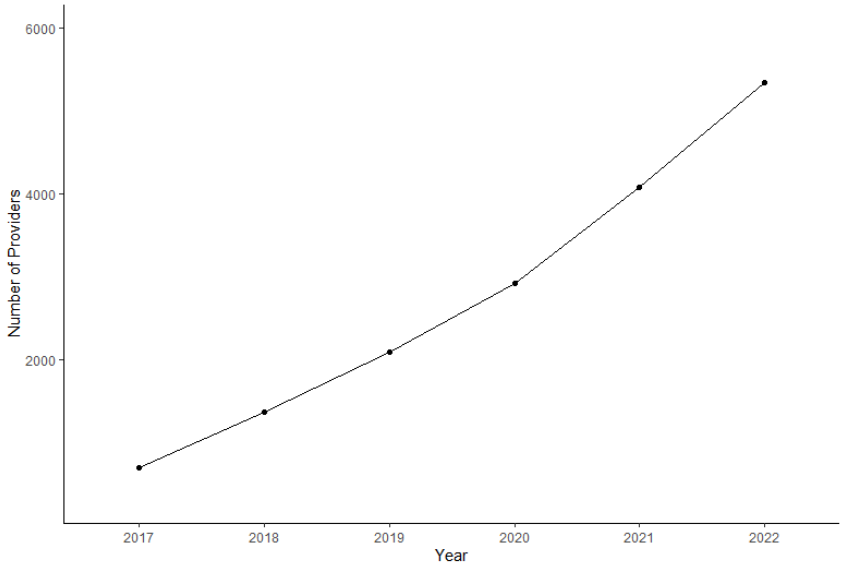
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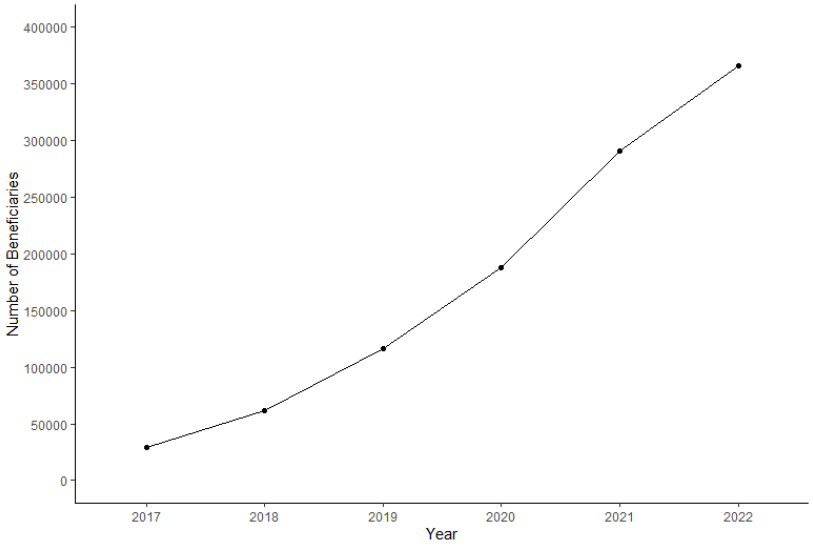
Tables and Figures

Figure 1: Growth in Corporate Primary Care Providers (CPCPs)

Panel A: Changes in number providers employed by CPCPs over time



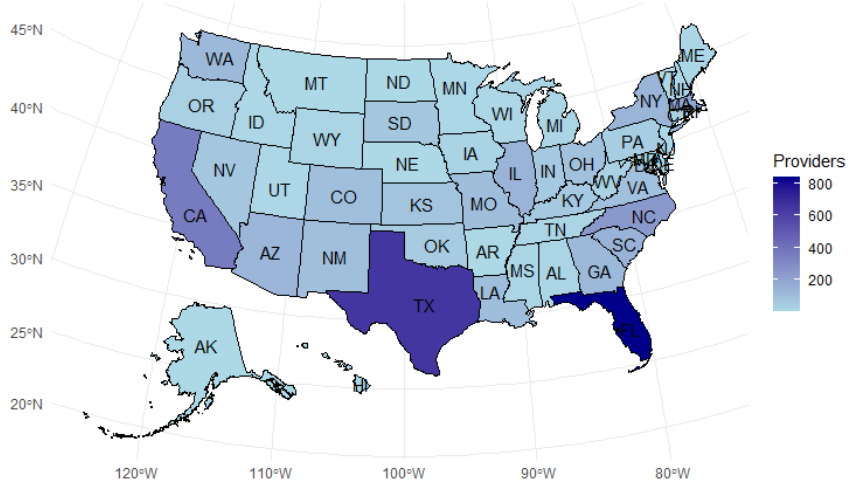
Panel B: Change in the number of beneficiaries attributed to a CPCPs over time



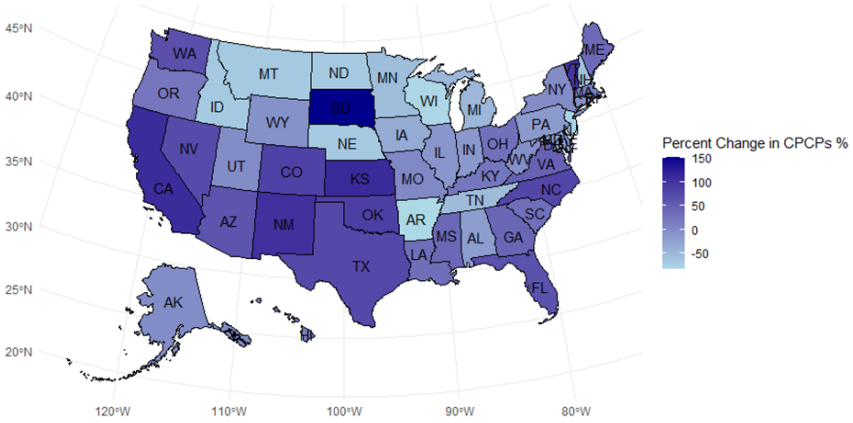
Notes: The growth of providers includes MDs, Dos, NPs, and PAs who provide primary care. The number of beneficiaries are those who were attributed to the CPCP providers on the basis of E&M codes. The number of beneficiaries in Panel B was created by multiplying our 20% sample data by five.

Figure 2: Geographic Variation in Corporate Primary Care Providers (CPCPs)

Panel A: Geographic distribution of CPCPs

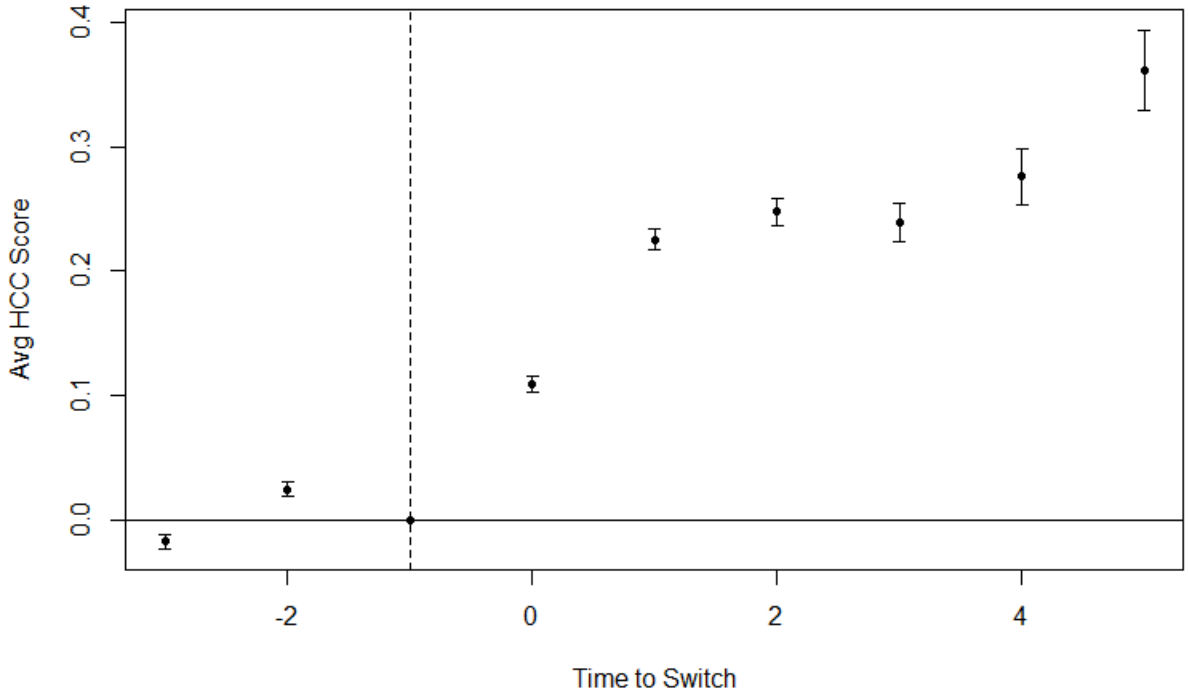


Panel B: Geographic trends in growth of CPCPs over time



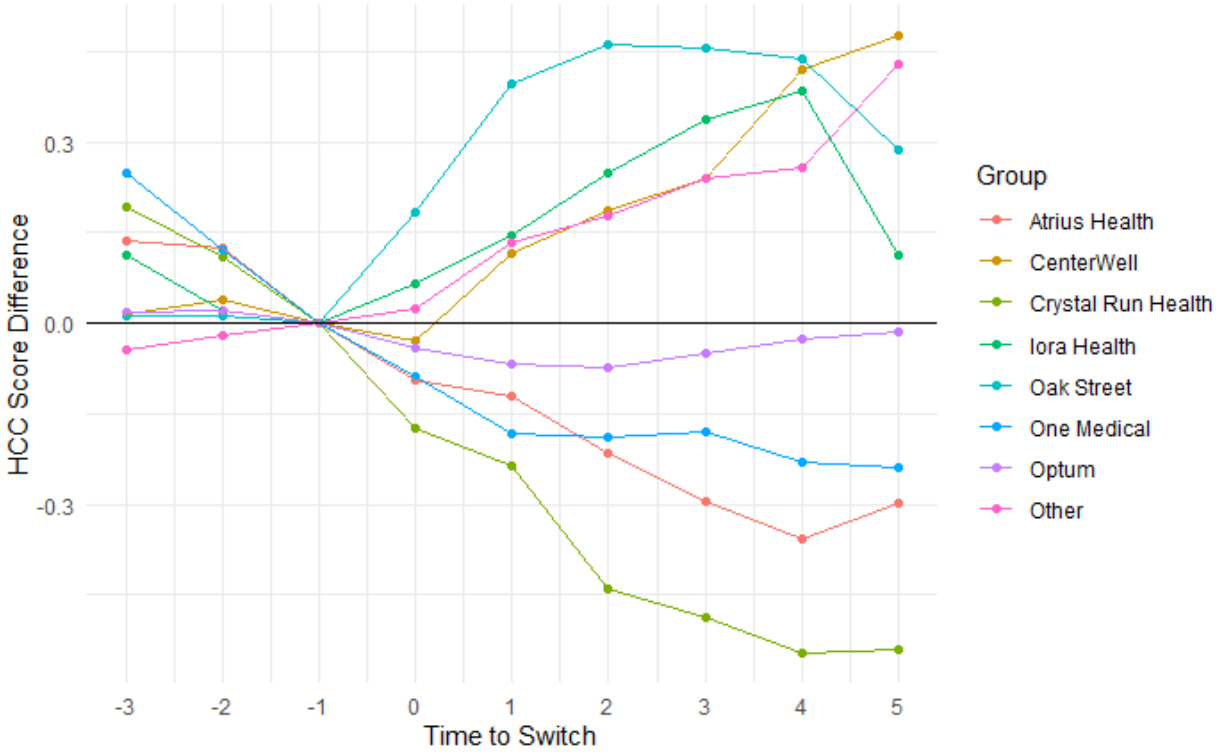
Notes: This figure plots geographic variation in identified CPCPs. Panel A presents the number of CPCP providers in each state in 2022. Panel B shows the percentage growth in CPCP providers by state over the 2017 to 2022 period.

Figure 3: Change in HCC Risk Score Following Switch to Corporate Primary Care Provider (CPC) Organization



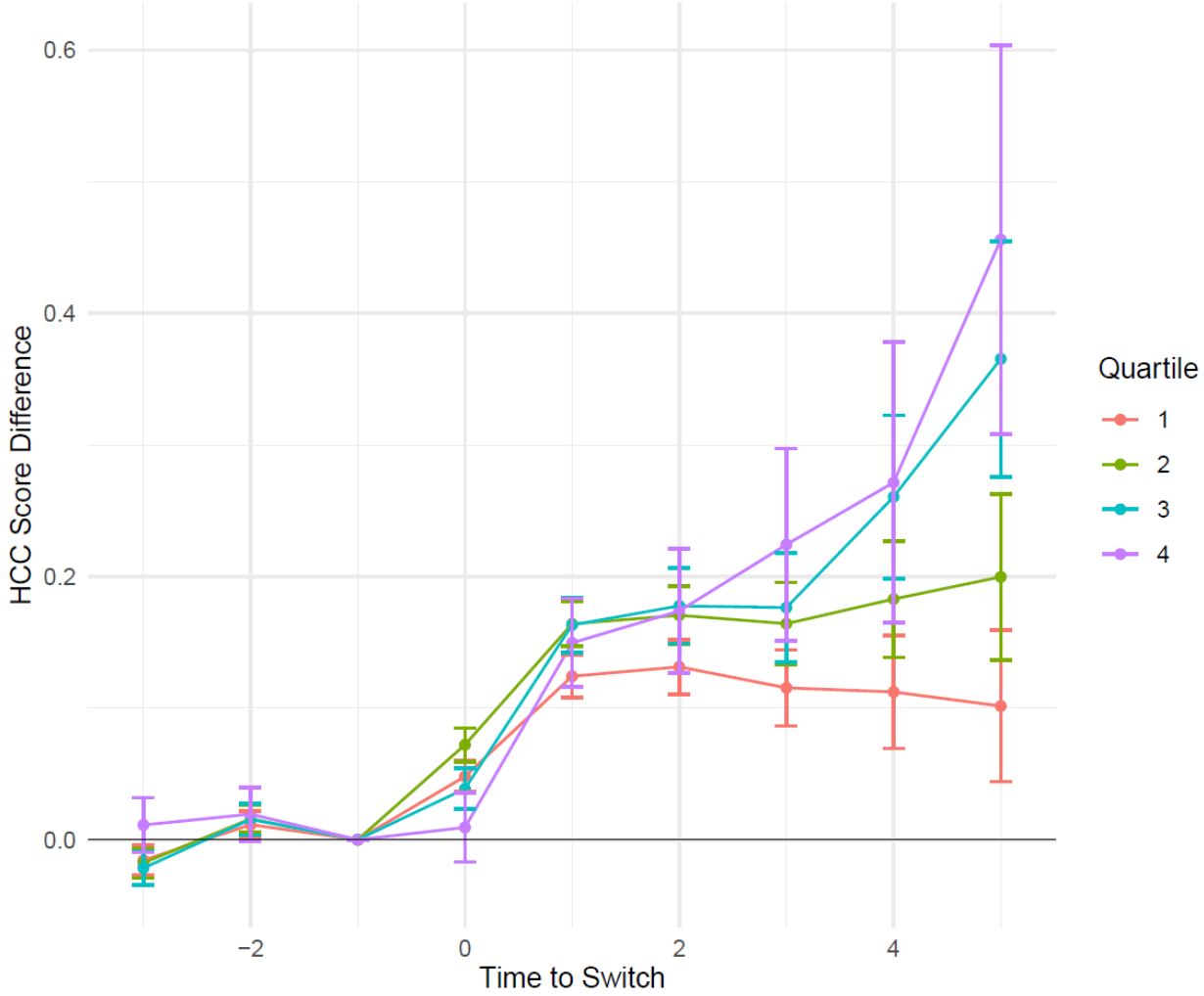
Notes: Results reflect changes in Medicare Advantage beneficiary HCC risk scores from our primary Sun Abraham (2021) two-way fixed effect model (equation 1). We include fixed effects for beneficiary, year, and individual provider. Standard errors are clustered at the provider level.

Figure 4: Company-Specific Changes in HCC Risk Scores



Notes: Results reflect changes in Medicare Advantage beneficiary HCC risk scores from our primary Sun Abraham (2021) two-way fixed effect model (equation 1), but stratified by each company in our sample. Each regression includes beneficiary, provider, and year fixed effects. Standard errors are clustered at the provider level.

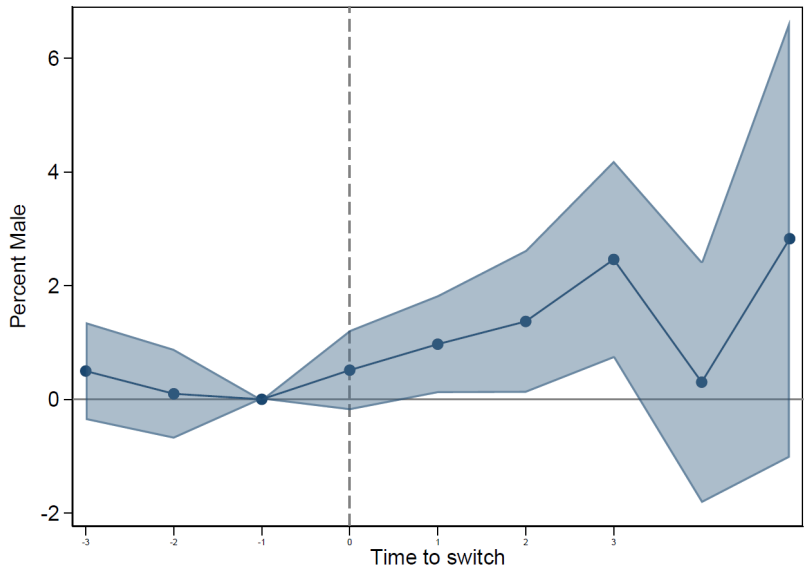
Figure 5: Change in HCC Scores By Quartile of Baseline HCC Scores



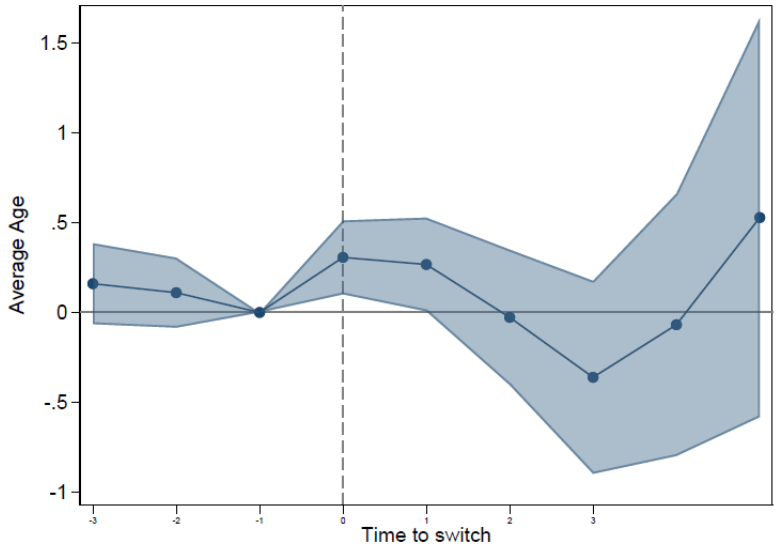
Notes: This figure presents event study results from separate Sun-Abraham event studies that estimate changes in Medicare Advantage beneficiary HCC risk scores following their attributed primary care provider's switch to a corporate primary care provider organization. Beneficiaries are stratified according to quartile of their baseline (2016) HCC risk score.

Figure 6: Changes in Attributed Beneficiary Demographic Characteristics

Panel A: Beneficiary Sex

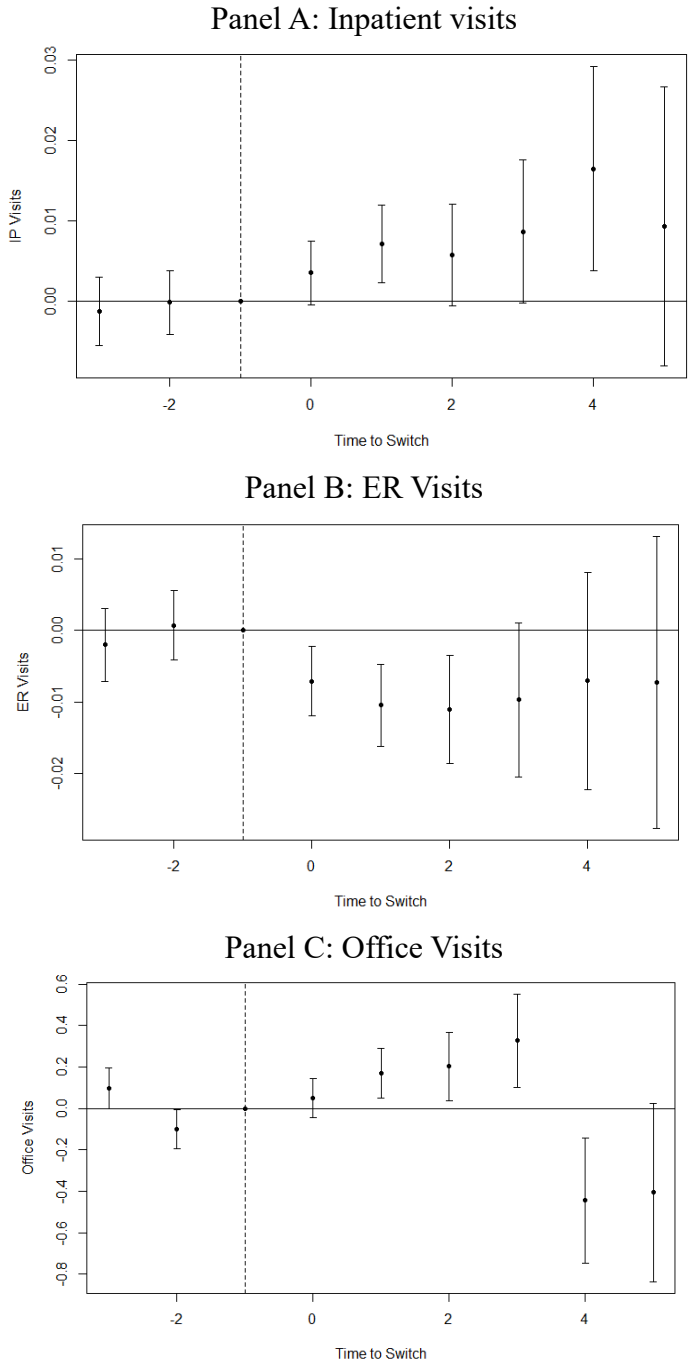


Panel B: Beneficiary Age



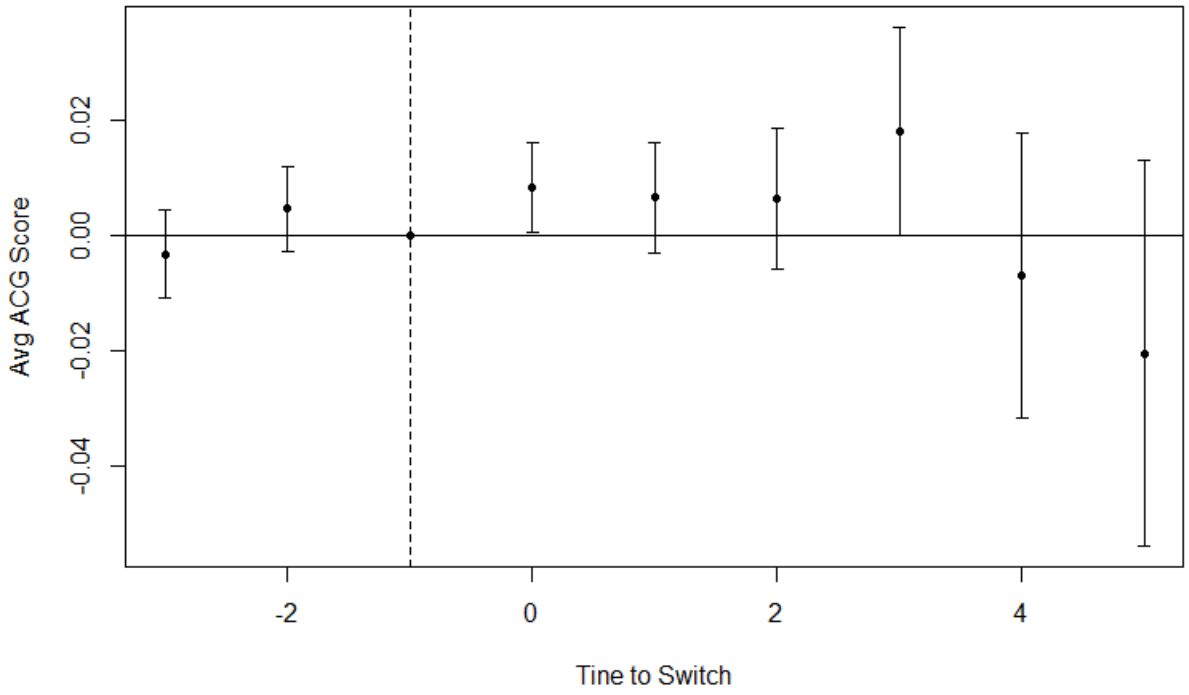
Notes: These event studies test for changes in the composition of attributed Medicare Advantage beneficiary characteristics for each primary care provider. Panel A presents changes in attributed beneficiary sex, while Panel B presents changes in attributed beneficiary age. Standard errors clustered at the provider level.

Figure 7: Changes in Attributed Beneficiary Healthcare Utilization Following Provider Switch to a CPCP



Notes: Results reflect changes in annual beneficiary number of inpatient visits (Panel A), Emergency Department (Panel B), and office visits (Panel C), estimated using our primary Sun Abraham (2021) two-way fixed effect model (equation 1). We include fixed effects for beneficiary, year, and individual provider. Standard errors are clustered at the provider level.

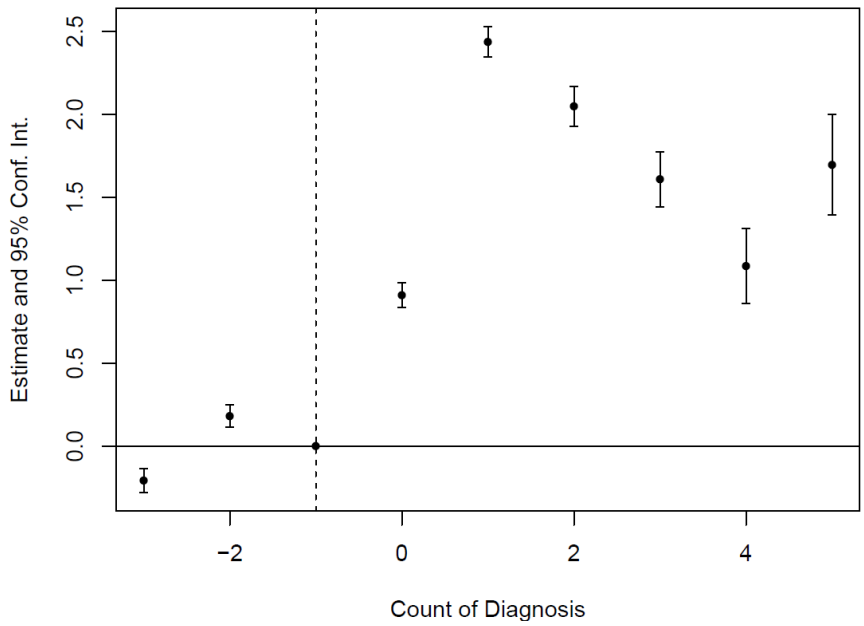
Figure 8: Change in ACG Pharmaceutical Risk Score Following Provider Switch to a CPCP



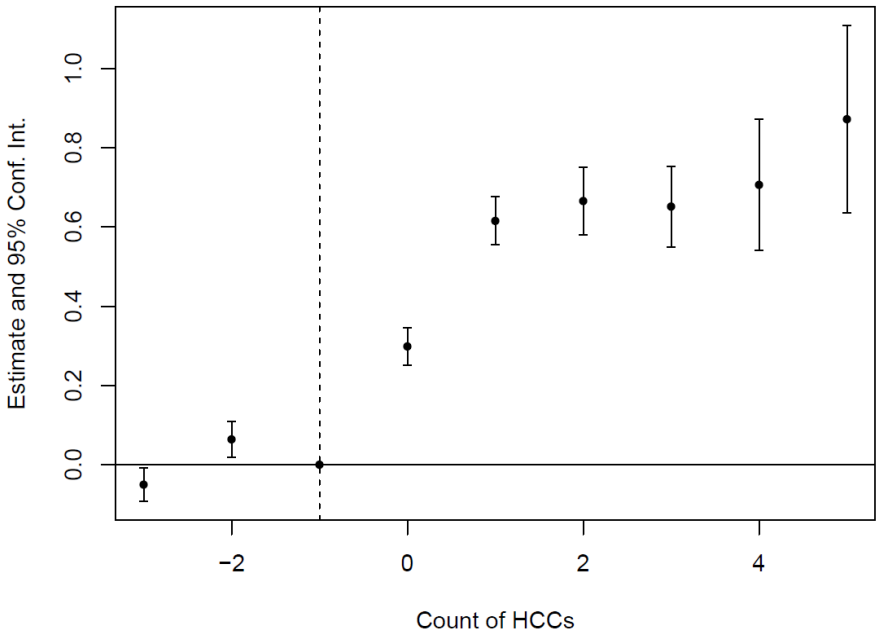
Notes: Results reflect changes in beneficiary risk score, calculated using the pharmaceutical portion of the Johns Hopkins All Cause Grouper (ACG) algorithm. Event studies are estimated using our primary Sun Abraham (2021) two-way fixed effect model (equation 1). We include fixed effects for beneficiary, year, and individual provider. Standard errors are clustered at the provider level.

Figure 9: Change in Number of Individual Diagnosis and HCC Codes

Panel A: Individual Diagnosis codes

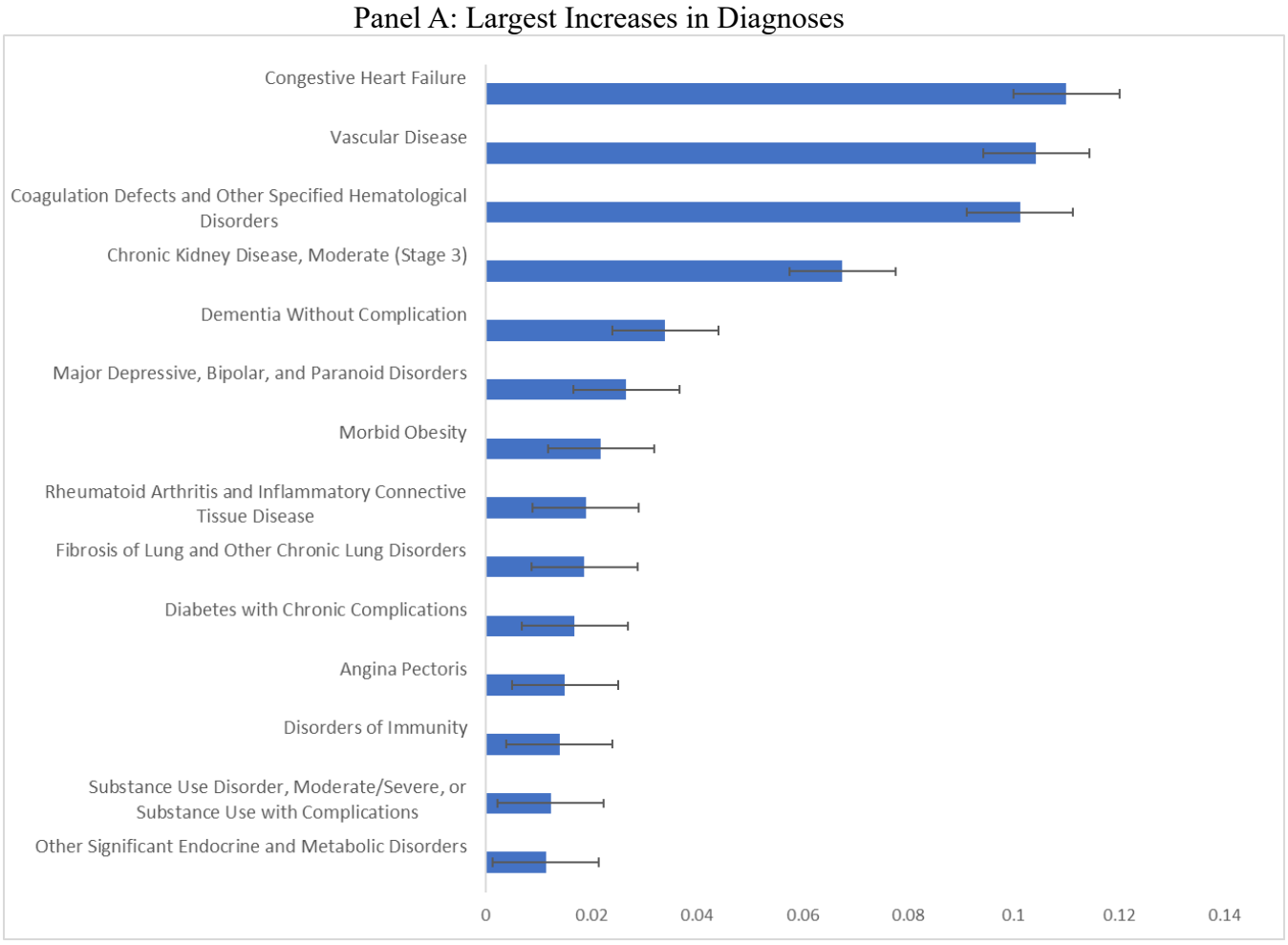


Panel B: Hierarchical Condition Category (HCC) Codes

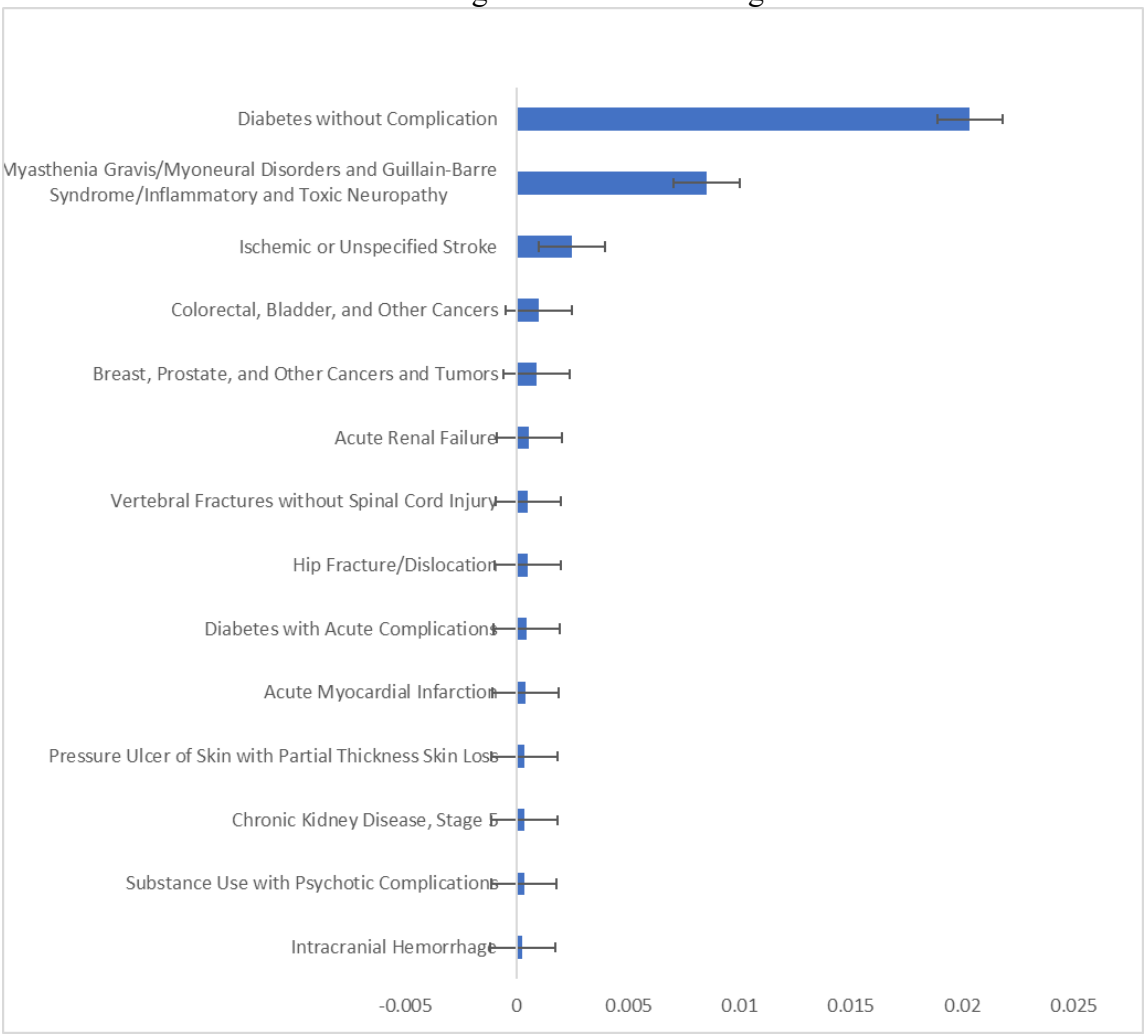


Notes: Results reflect changes in the number of individual diagnosis codes (Panel A) and Hierarchical Condition Category (HCC) codes billed to each MA beneficiary. Event studies are estimated using our primary Sun Abraham (2021) two-way fixed effect model (equation 1). We include fixed effects for beneficiary, year, and individual provider. Standard errors are clustered at the provider level.

Figure 10: Change in Diagnosis Codes

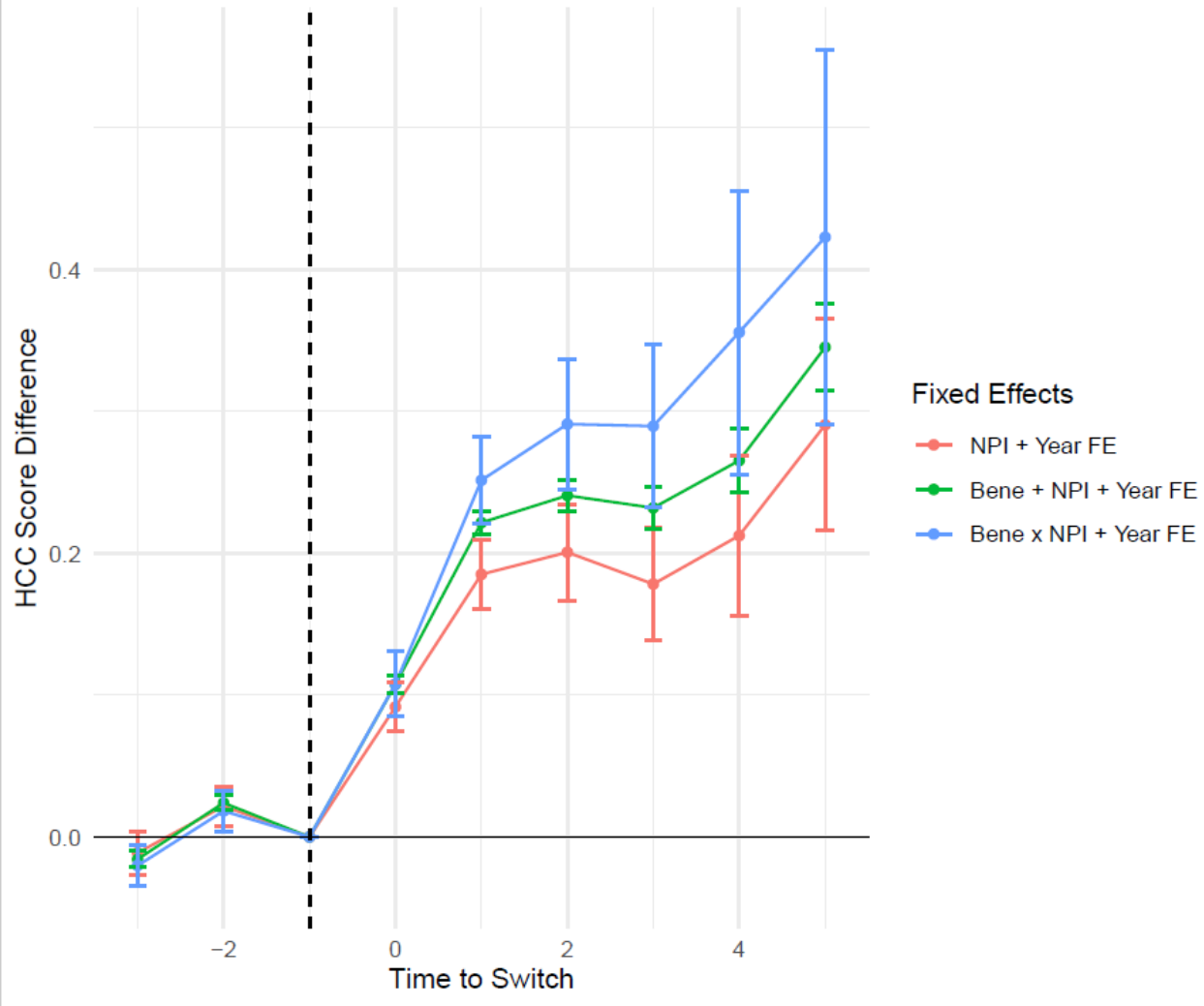


Panel B: Largest Decreases in Diagnoses



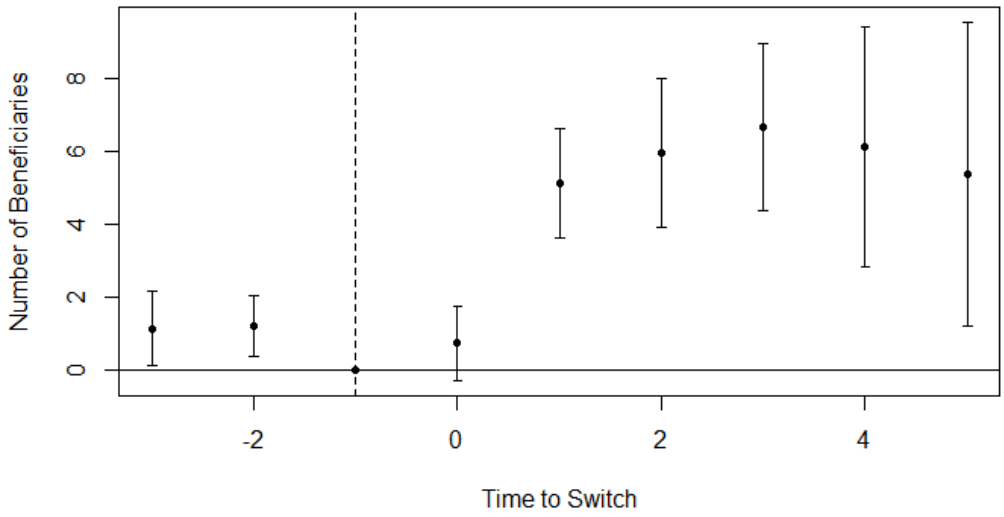
Appendix Tables and Figures

Appendix Figure 1: Alternative Fixed Effects Specifications



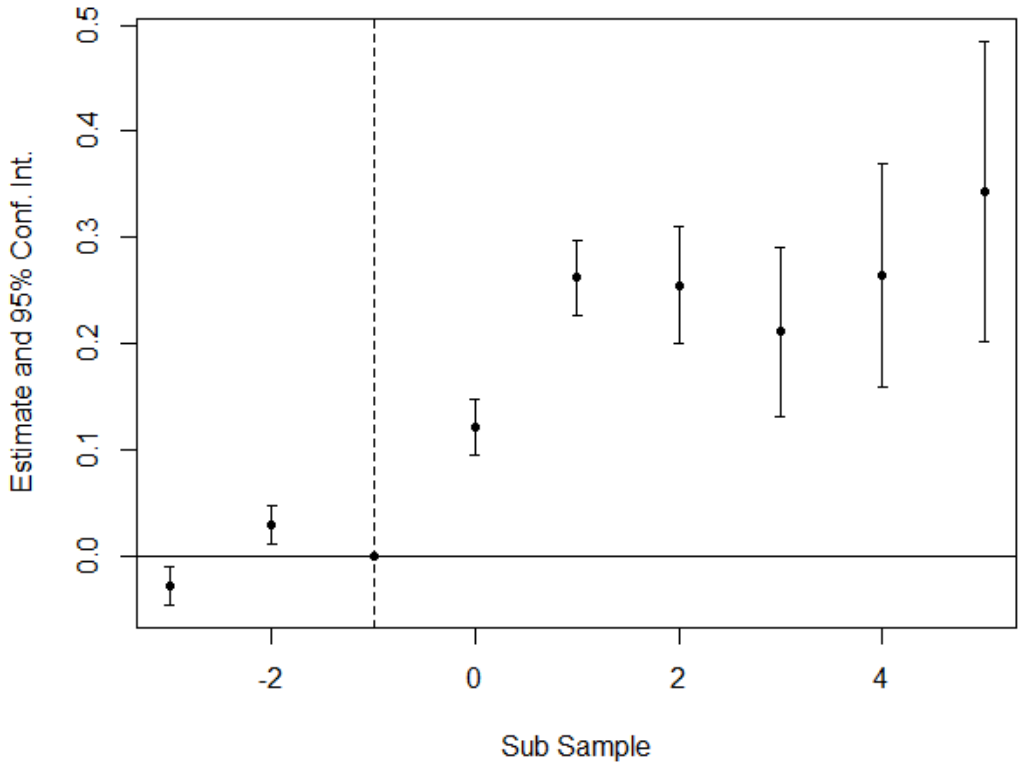
Notes: Results reflect changes in Medicare Advantage beneficiary HCC risk scores from our primary Sun Abraham (2021) two-way fixed effect model (equation 1). This figure iteratively adds provider (NPI) and year fixed effects; beneficiary, NPI, and year fixed effects; and interacted beneficiary-NPI and year fixed effects. Standard errors are clustered at the provider level.

Appendix Figure 2: Change in number of Attributed MA Beneficiaries



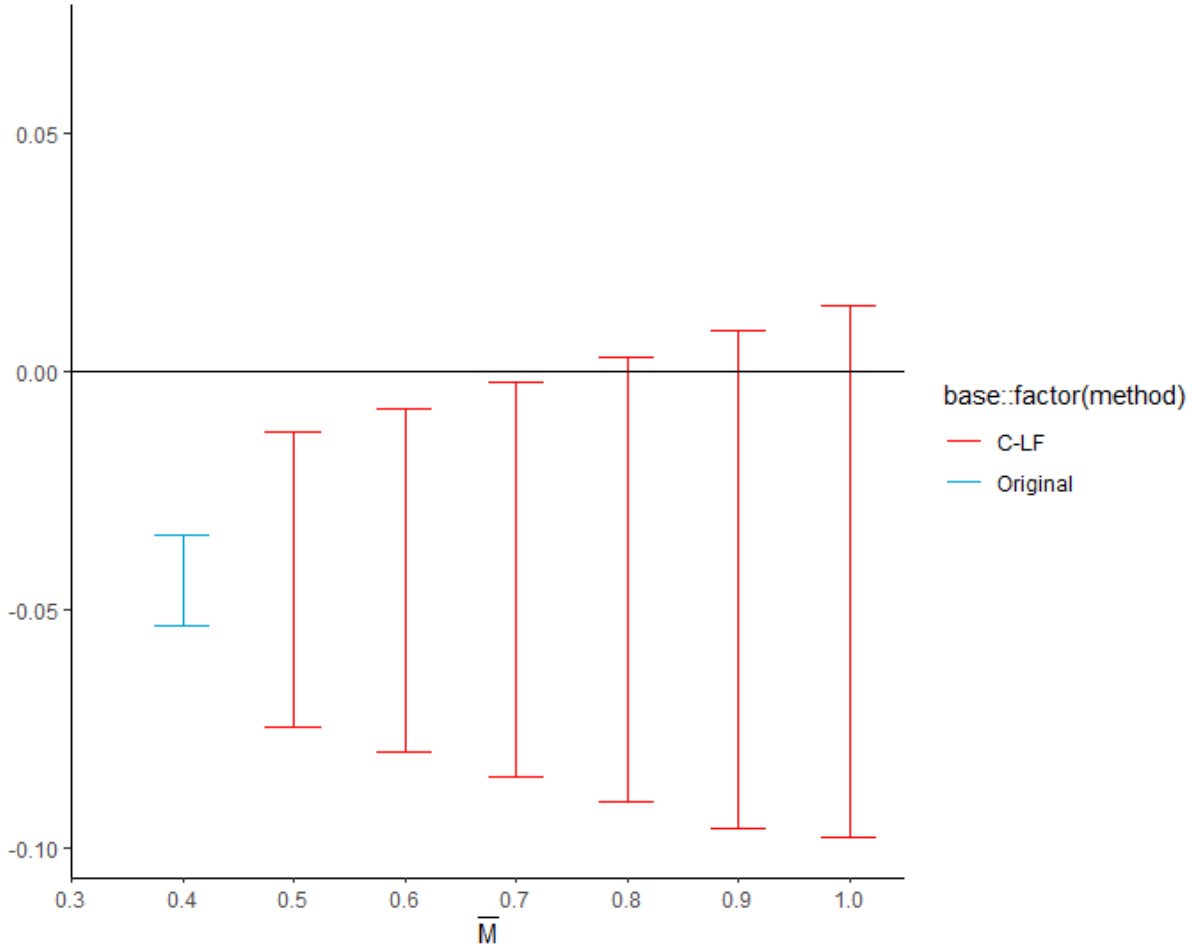
Notes: This event study tests for changes in the number of attributed Medicare Advantage beneficiary characteristics for each primary care provider. Provider and year fixed effects include. Standard errors clustered at the provider level.

Appendix Figure 3: Consistent Beneficiary-Provider Pairings over time



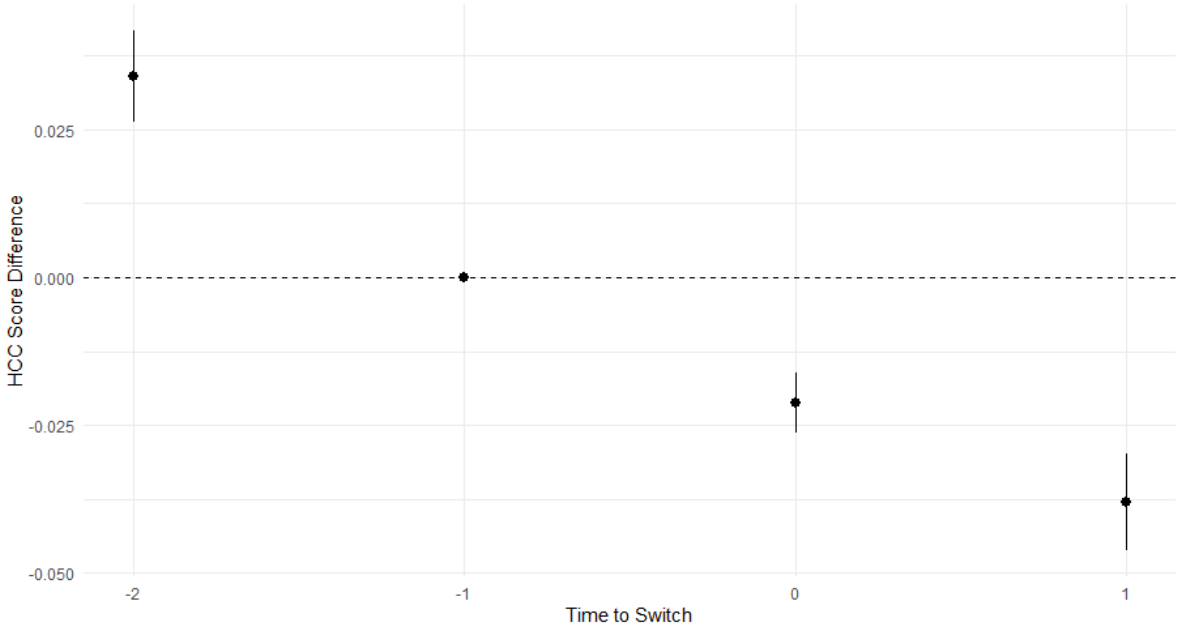
Notes: This event study tests for changes in average HCC scores of those beneficiaries that were attributed to the same treatment group primary care provider for all the 7 years in the data.

Appendix Figure 4: Results from Honest DiD Test



Notes: HonestDID estimation uses the smoothness restrictions for the sensitivity analysis, varying the extent to which the slope of the difference in trends changes between periods: going from no change in slope (M=0) up to ten percent (M=0.1), with intervals of 0.25.

Appendix 5: Comparison of changes in HCC after switching to hospital owned organization



Notes: Results reflect changes in Medicare Advantage beneficiary HCC risk scores from our primary Sun Abraham (2021) two-way fixed effect model (equation 1), but using an alternative form of consolidation—hospital-physician vertical integration. We include fixed effects for beneficiary, year, and individual provider. Standard errors are clustered at the provider level.