How Do Primary Care Physicians Affect Patient Care? Evidence from Physician Exits

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Abstract

Primary care physicians (PCP) are central to the U.S. health care system; they diagnose and treat chronic conditions, and they refer patients to specialists, and yet it is unclear how differences in their practice styles affect the quantity and quality of care that patients receive. In this paper, we exploit variation in PCP practice styles within patients over time by focusing on Medicare beneficiaries who are affected by PCP relocations and retirements. First, we characterize PCP practice style intensity for fifteen different types health care spending and utilization. We then focus on physicians who move regions or quit the Medicare program, and we observe where their patients receive care after they "exit." We take the difference in mean practice styles between the physicians who exited and the physicians who subsequently treated the exiting physicians' patients. Then we evaluate patients' health care spending and utilization in the years after their physicians exit. We have two key findings: (1) Primary care physicians have the greatest effects on primary care spending, but their practice styles also affect inpatient, outpatient, specialist, and drug spending, and the number of diagnoses that patients receive. Our decompositions show that 22-72% of the variation in health care utilization is explained by PCP practice styles, with the remainder explained by differences across PCPs in their patients' health and preferences. (2) PCP practice styles have the greatest effects on patient utilization in the year after an exit, but the effects remain relatively large in the long run (30-40% of variation), particularly for patients who do not switch doctors again. Our results suggest that PCPs have long-lasting effects on patients' health. Information about practice styles may help patients choose physicians who are more appropriate for them.

1 Introduction

Health care spending per Medicare beneficiary has been steadily increasing by 2-7% since the early 1990s, and is projected to increase by 4.6% per year from 2017-2027 (Cubanski and Neuman 2018). An important policy question is whether higher spending reflects higher value care. Patients may receive high-value care if health care providers act as perfect agents for their patients, supplying the right amount of care to match their patients' preferences and address their patients' health conditions. Patients might not receive high-value care if their health care providers do not act as perfect agents, supplying too much or too little care in relation to their patients' needs and preferences. Providers might not act as perfect agents if they face conflicting incentives (Clemens and Gottlieb 2014) or maintain willful ignorance of their patients' needs due to time constraints, for example. Excessive care supplied by imperfect agents is often called "supply-induced demand" (McGuire 2000). Canonical economic models suggest that higher spending driven by patient demand may be efficient, but higher spending driven by supply-induced demand is inefficient (Wennberg 2010). Thus, an important empirical question is to what extent patients vs. providers are responsible for variation in health care utilization and spending.

By studying patients who moved across regions, Finkelstein et al. (2016) have decomposed variation in Medicare spending across regions into a "patient-driven demand-side" component and a "provider-driven, supply-side" component. They find that approximately half of the variation in spending across regions is due to supply-side effects, with the other half due to differences in patient health and preferences. In this paper, we take a similar approach, but ask to what extent variation in health care utilization across patients within regions is explained by primary care providers (PCPs) versus differences in patient health and preferences. Instead of following patients who move across regions, we follow patients who lose their primary care provider when their provider moves to another region or leaves the Medicare program. Our contribution is to show how primary care providers affect the allocation of health care services that patients receive.

We focus our analysis on primary care providers who treat Medicare patients for several reasons. First, patients are more connected to their PCPs than to other health care providers, whom they may only visit for acute conditions. The long-term duration of the PCP-patient relationship, especially among patients who remain continuously enrolled in Medicare, allows us to examine the effects of switching PCPs on health care utilization and diagnostic outcomes. Second, PCPs serve many functions; they diagnose conditions, treat conditions, prescribe drugs, and refer patients to specialists. We use the term "PCP practice styles" to describe the intensity with which PCPs perform their functions. For example, some PCPs diagnose more conditions than other PCPs and some PCPs refer more patients to specialists. The goal of this paper is to show how PCP practice style intensity affects the care that patients receive. Third, PCPs provide frontline health

care to most of the insured population in the US, so our estimates of how PCP practice styles affect the Medicare population may extend to the general population, with some caveats, to be discussed later.

The goal of our empirical method is to obtain variation in PCP practice styles within patients over time, in order to hold constant time-invariant patient preferences and health status, as we examine the effects of PCP practice styles on patients' health care utilization and diagnostic outcomes. Our method proceeds in four steps. First, we estimate models of health care spending, visits, and diagnoses, where we allow PCPs to affect these outcomes by including jackknife "leave-one-out" PCP fixed effects in the models. For each outcome, we call the fixed effect a practice style measure. For example, PCPs have different practice style measures for total spending, inpatient spending, outpatient facility spending, their own spending (PCP spending), specialist spending, and so on. We use the empirical Bayes method to adjust the fixed effects, which are measured with more error for PCPs who have fewer patients. Second, we focus on PCPs who move locations or leave the Medicare program, and we observe where their patients receive care following their "exit." Then we subtract the old PCP's practice style measure from the new PCP's practice style measure. For example, if the difference in total spending PCP practice styles is positive, then the new PCPs have total spending practice styles that are more intensive than the original PCPs' styles. Third, we compare patients who switched to higher intensity PCPs to patients who switched to lower-intensity PCPs after their original PCPs exited. We estimate first difference models to measure the first-year effects of switching PCPs, and then we estimate event studies to identify the long-term effects of switching PCPs. Finally, as robustness, we use a mean reversion instrument to predict the change in PCP practice styles following an exit, and we re-estimate our first difference results using the predicted change in practice styles instead of the actual change.

We find that PCPs explain 22-72% of the within-region variation in Medicare beneficiaries' health care spending, visits, and diagnoses. On the high end, PCP spending increases by 70 cents when patients switch to PCPs with $1 higher PCP spending practice styles in the year after their original PCPs exit. The effect falls to 40 cents in the second year after their original PCPs exit, and the decline is driven by patients who re-select PCPs. For patients who remain with the same PCP following the original PCP exit, the effect starts at 90 cents and hovers around 80 cents up to five years after the exit. On the low end, the number of chronic conditions increases by 0.35 immediately after beneficiaries switch to providers whose patients have 1 more chronic condition on their records. Unlike the spending estimates, the new PCP's effect on chronic conditions remains constant and elevated over time, even for beneficiaries who re-select PCPs in the future. Other outcomes that we examine include total spending, inpatient spending, outpatient facility spending, specialist spending, drug spending, post-acute care spending, number of PCP office visits, number of specialist office visits, number of emergency department visits, number of unique diagnoses, and

the number of disabling conditions per beneficiary per year. The percent of variation attributable to PCPs is about 45%, on average, for these other outcomes, which is very similar to the Finkelstein et al. (2016) estimates. Using our mean reversion instrument, the percent of variation attributable to PCPs decreases by less than 6 percentage points for most outcomes.

This paper is related to the physician practice style literature, which has documented variation across physicians in how they treat patients, and has shown how practice style variation affects patient outcomes (Agha et al. 2018; Chan 2016; Currie et al. 2016; Currie and MacLeod 2016; Epstein and Nicholson 2009; Fletcher et al. 2014; Gowrisankaran et al. 2017; Laird and Nielsen 2018; Molitor 2016; Silver 2016; Van Parys 2016). Within this literature, very few papers have focused on the practice styles of primary care physicians in the US, possibly due to data limitations and identification challenges. Outside the US, Alkalay et al. 2017 examine how PCP practice patterns change in the face of time constraints in Israel and Grytten and Sorenson (2002) estimate variation in PCP practice styles in Norway. Grytten and Sorenson find that, conditional on a diagnosis, PCP practice styles explain 47-66% of the variation across patients in spending on laboratory tests, consultations, and specific procedures. To date, however, there has been no similar analysis in the US, where physicians arguably have more freedom to choose treatment regimes.

In relation to the practice style variation literature, our paper offers three contributions. The first contribution is to combine the physician relocations and retirements quasi-experiment with PCPs' vast number of functionalities, making our paper's results more comprehensive than papers that have focused on narrower definitions of practice styles. We find that PCP practice styles have far-reaching, long-term consequences for patients. Even for more distant measures of utilization such as inpatient care, PCP assignments explain up to 58% of the short-run variation in spending. Second, by risk-adjusting our practice style measures using different sets of patient covariates, we show what drives utilization differences across patients in the short run: 45% of the total spending variation is due to PCP practice styles, 32% is due to observable patient characteristics and underlying health conditions, and 23% is explained by patient preferences and unobservable health status. In the long run, however, we show that patient preferences and health status play a larger role (up to 65% of variation) as patients opt to re-select PCPs. Third, we show that there is not much positive patient-physician selection in the short run. Results using our IV method are substantively similar results to our baseline first-differenced estimates. Thus, even though some patients may choose new PCPs for endogenous reasons, they cannot easily *a priori* select new PCPs whose practice styles match their preferences. In other words, patients appear to be more reactive than proactive in their search behavior.

The rest of the paper proceeds as follows: Section 2 describes the data and sample selection process. Section 3 describes the empirical method. Section 4 presents the results. Section 5 concludes with a discussion of policy implications.

2 Data and Sample Construction

In this section, we describe our data, variable definitions, and how we construct our sample. Our data include 20% Medicare Parts A and B claims for enrollees ages 65 and older with at least one month of Traditional Medicare (TM) enrollment between 2007-2013. We identify about 42 million unique beneficiary-years meeting this criterion. We then drop 3 million observations associated with beneficiaries who moved regions over the time period, leaving us with 39 million beneficiary-years.

Since our paper is focused on primary care provider practice styles, we use the Carrier claims to attribute Medicare beneficiaries to their primary care providers each year. We restrict to evaluation and management (E&M) claims in the Carrier file because those claims reflect billing for office visits.[1] About 8 million beneficiary-years in our TM sample have no E&M claims. About 27 million beneficiary-years have E&M claims with physicians whose primary specialty is either family practice, internal medicine, or general medicine. For those 69% ($\frac{27}{39}$) of beneficiary-years, the attributed PCP is the National Provider ID (NPI) associated with the modal provider who specializes in one of the three aforementioned fields. For the remaining 10% of beneficiaries ($\frac{4}{39}$) who have E&M claims, but do not have E&M claims with a physician who specializes in primary care, the attributed PCP is the modal physician who bills for E&M claims, regardless of specialty. In this way, we keep all patients with E&M claims, and do not drop patients if they fail to match to physicians with traditional PCP specialities in every year.

After we construct our sample of PCPs, we use the Carrier file to identify the PCPs who relocate and the PCPs who stop treating TM patients. For each physician, we gathered all of the E&M claims where the physician is the performing provider, and we identify the modal billing zip code for each physician each year. If the first two digits of the modal billing zip code change from one year to the next, we say that PCP has "relocated."[2] Next, we classify PCPs who appear at least once, and then never again, as "retirements." We use the term "exit" to refer to PCPs who relocate or retire. Among the 120,000 PCPs in our sample, 2,400 relocate at some point between 2007-2013 and 2,300 retire from the TM program. PCPs who exit are attributed to fewer beneficiaries, on average, than PCPs who do not exit. Exiting PCPs are attributed to approximately 20 patients per year, while non-exiting PCPs are attributed to approximately 25 patients per year.[3] The number of attributed beneficiaries is less than the total number of beneficiaries each PCP treats. Exiting PCPs treat, on average, 100 patients per year and non-exiting PCPs treat 120 patients per year. The

[1] We identify E&M claims using the BETOS codes on the Carrier claim line items.

[2] The first two digits of a zip code generally conform with state boundaries when states are small, and conform to large regions within states when states are larger.

[3] Since the number of attributed beneficiaries per PCP per year is rather low, we pool all attributed beneficiaries across years when estimating PCP practice styles.

fact that PCPs treat more patients than they are attributed to speaks to the fragmented nature of health care delivery in the TM program, which has been documented by Agha et al. (2018).

Approximately 35 million beneficiary-years could be attributed to a primary care provider at some point in time. Approximately 2.2 million (7%) beneficiary-years were affected by PCP exits at some point during the sample period. Another 21 million (61%) beneficiary-years were attributed to more than one PCP throughout the sample period, possibly because they sought care from different providers as their health changed over time. The remaining 12 million (37%) beneficiary-years were attributed to the same PCP throughout their duration in the sample.

In Tables 1 and 2, we compare the beneficiaries who were affected by PCP exits (column 1) to beneficiaries who were not affected by exits, but who were attributed to a primary provider (column 2). Our empirical approach does not compare beneficiaries who were affected by PCP exits to those who were not; nevertheless, the tables show that the sample of beneficiaries affected by exits is quite similar to the sample of beneficiaries never affected by exits, at least according to the observable dimensions in the data. We interpret such covariate balance as suggestive evidence that PCPs relocate and retire for reasons that are unrelated to their patient populations.

Table 1, column 1 further shows the average demographic characteristics, chronic conditions, and disabling conditions in our Medicare sample. The average patient age is 76 years old, 59% of patients are female, and 13% are nonwhite. The vast majority have 12 months of Part A and B coverage, and the average number of HMO months is only 0.24 (given our use of the Carrier E&M claims to define the sample). Approximately half of the sample has Part D coverage and 16% has the Part D low-income subsidy coverage. About 15% are dually enrolled in Medicare and Medicaid. Less than 2% qualifies for Medicare through disability or ESRD status. Among the 40 chronic and disabling conditions listed, the most common conditions are hypertension (64%), hyperlipidemia/high cholesterol (52%), ischemic heart disease (33%), rheumatoid arthritis (32%), diabetes (27%), cataracts (25%), and anemia (24%). Toward the end of the paper, we use the variables in Table 1 as "risk-adjusters" when measuring PCP practice styles, in order to determine how much variation in utilization across PCPs is due to differences in the observable characteristics of the patient populations.

Table 2, column 1 shows average health care spending, number of visits, and the number of diagnoses for patients in our sample. Average yearly total spending is around $12,200, and inpatient spending comprises the highest share of the total at 41% ($4,950). Outpatient spending is 28% ($3,359) of the total, pharmaceutical drug spending is 16% ($1,926) of the total, and post-acute care spending is 15% ($1,818) of the total. Physician office spending makes up a much smaller share of the total at 5.3% ($646) per year, of which only about half of the spending could be attributed to the patient's primary care provider ($334). Despite the fact that PCPs do not bill for much in-office care themselves, we later show that PCP practice styles affect all components of

health care utilization.

Patients in our sample had, on average, 8.7 office visits per year, where half of the visits are to the attributed PCP and the other half are split amongst other providers. About one in two patients visits the emergency department (ED) each year. The average patient has 14.5 unique ICD-9 code diagnoses listed on their office visit claims records, amounting to 3.9 unique chronic conditions and 0.7 disabling conditions, as measured by the Center for Medicare and Medicaid Services. In the next section, we will allow PCPs to have "practice styles" related to all of the outcomes listed in Table 2.

3 Empirical Methods

In this section we describe our research design for estimating the effects of primary care physician practice styles on patients' health care utilization and diagnostic outcomes. We begin by describing a simple statistical model which we use to motivate our event-study estimating equation. Our approach broadly follows that of Finkelstein et al. (2016), as applied to our setting.

3.1 Statistical Model

Assume the following simple model for patient health care utilization:

$$y_{idt} = \alpha_i + \delta_{d(i,t)} + x_{it}\beta + \epsilon_{it}$$

In this specification, y_{idt} is the value of outcome y for individual i, who is treated by physician d in year t. α_i is an individual fixed effect, and $\delta_{d(i,t)}$ is the effect of physician d's practice style (with regards to outcome y) on patient i's outcome, where $d(i,t)$ indexes the physician attributed to patient i in year t. $x_{i,t}$ is a vector of time varying patient characteristics, hospital-referral regions fixed effects, and calendar year fixed effects. We define an individual's "risk-adjusted" outcome as:

$$\tilde{y}_{idt} \equiv y_{idt} - x_{it}\beta = \alpha_i + \delta_{d(i,t)} + \epsilon_{it}$$

Our goal is to study the degree to which variation in health care utilization across physicians is attributable to the physicians' practice styles. This requires a plausibly exogenous change in the practice styles of a patient's physician. Specifically, we need to utilize a source of variation that is presumably uncorrelated with the patient's underlying evolution in health, preferences, and

health care utilization in the absence of a change. To achieve this goal, we focus on patients who experienced a change in their assigned primary care physician, where the change is triggered by their original physician's geographical relocation or retirement. We leverage the change in practice styles from the patient's original physician to the new physician as our source of variation. We discuss the identifying assumption and its validity below.

For patient i, whose assigned physician changed from d_0 to d_1, due to d_0's relocation or retirement, we denote by γ_i as the difference in average utilization between the new and the original physician: $\gamma_i \equiv E[\tilde{y}_{d_1}] - E[\tilde{y}_{d_0}]$, where the average is taken over all time periods and all patients assigned to the physician. Empirically, we include all patients besides patient i, so we use "leave-one-out" means. With these definitions, γ_i is the sum of the differences of the physician component and the patients' components.

Next we denote the share of the difference across physicians d_0 and d_1 that is attributable to physician practice styles as: $\theta = \frac{\delta_{d_1} - \delta_{d_0}}{E[\tilde{y}_{d_1}] - E[\tilde{y}_{d_0}]}$. We define $r(i,t)$ to be the period relative to the physician's relocation or retirement. For patients whose physicians relocate or retire, we can write:

$$\tilde{y}_{it} = \alpha_i + \delta_{d_0} + I_{r(i,t)\geq 0}\theta\gamma_i + x_{it}\beta + \epsilon_{it}$$

where θ is our parameter of interest: it is the average change in health care utilization in the years following the change in the physician assignment, relative to the difference between the new and old physicians' means.

3.2 Estimating Equations

Based on this equation, we take two specifications to the data. Our first specification is the equivalent first difference representation. For any variable x, we denote by Δx_i, the difference for patient i between the variable's mean in the year before the PCP exit ($r(i,t) = -1$) and the year of the PCP exit ($r(i,t) = 0$). With this definition, our first estimating equation is a simple first-difference equation of the following form:

$$\Delta y_i = \theta\gamma_i + \Delta x_{it}\beta + \Delta\epsilon_i$$

Our second specification allows for flexible interactions with time with respect to the event. Specifically, we estimate the event-study equation of the following form:

$$y_{it} = \alpha_i + \sum_{r=-5}^{r=5} I_r \theta_r \gamma_i + x_{it}\beta + \epsilon_i$$

where $\alpha_i = \alpha_i + \delta_{d_0}$. This event study specification will allow us to test for parallel trends in the pre-period, as well as to investigate long-run dynamics in the post-period.

3.3 Identifying Assumptions

Our identifying assumption is that the trends in health care utilization for patients exposed to different degrees of practice style changes between their exiting PCPs and their new PCPs would run parallel in the absence of PCP exits. Thus, we test for absence of differential pre-trends in the event study. Reassuringly, we consistently show throughout the analysis that there are virtually no differential trends across the differently treated beneficiaries in the years prior to the PCP exits.

3.4 Robustness

To further explore the validity of our identifying assumption, we augment the analysis with an instrumental variable approach designed to address the fact that patient preferences may change at the time their PCPs exit. Specifically, we instrument for the new physician's practice style using the difference between the old physician's practice style and the average practice styles of all remaining doctors in the patient's hospital referral region. We re-estimate our first differenced model using this "mean reverting" instrument, and we find economically similar results.

3.5 External Validity

Our sample design requires us to observe patients at least once in the "pre-period" before their PCPs exit and at least once in the "post-period" when their PCPs exit. Thus, our estimated effects are conditional on patients who exhibit the following two characteristics: (1) they remain enrolled in Traditional Medicare after their PCPs exit and (2) they continue to receive office-based evaluation and management care after their PCPs exit. Table 1 shows that patient characteristics and diagnoses are relatively balanced across the sample of patients affected by PCP exits and the sample of patients who were never affected by exits. Thus, our results are likely representative of all Medicare beneficiaries who remain continuously enrolled in TM, and might be extrapolated to other populations who have continuous health insurance coverage and who have frequent interactions with office-based providers.

4 Results

This section is divided into seven subsections, and each subsection presents a different set of results showing how PCP practice styles affect patient health care utilization. The first subsection focuses on the overall value-added of PCP fixed effects in models of health care utilization. The second subsection describes where our identifying variation comes from in the sample of patients affected by PCP exits. The third subsection describes our baseline first-differenced estimates for the first-year effects of switching to PCPs with more intensive practice styles. The fourth subsection describes the event study results, where we examine part of the internal validity assumption and document the long run effects of switching to PCPs with more intensive practice styles. The fifth subsection returns to the first differenced results, but describes how the results change when we employ a mean-reversion instrument to predict the change in PCP practice styles that patients experience following exits. The sixth subsection decomposes the total variation across PCPs in health care utilization into a supply-side component, an observable patient characteristic/health component, and an unobservable patient preference/health component. The seventh section uses the IV method combined with the practice style risk adjustment method described in the fifth and sixth subsections to show how switching to PCPs with higher office-based spending and visits affects components of health care utilization such as inpatient care, outpatient care, pharmaceutical drug spending, and ED visits.

4.1 Value-added of PCP Fixed Effects

Table 3 shows adjusted R^2 results from estimating different models of health care utilization. Each column corresponds to a model with a different set of covariates, and each row corresponds to a model with a different health care utilization outcome. The model in column 1 only includes controls for calendar year fixed effects and patient characteristics (from the top two panels of Table 1). Column 2 adds hospital referral region fixed effects from the Dartmouth Atlas. Column 3 adds PCP fixed effects. Column 4 removes PCP fixed effects and adds controls for all of the chronic conditions and disabling conditions listed in the Medicare Master Beneficiary Summary File, and described in the bottom panel of Table 2. Column 5 adds back in PCP fixed effects while retaining the chronic and disabling condition indicators.

The focus of Table 3 is on the difference in adjusted R^2 from models that do not include PCP fixed effects to those that do. The top row shows that the percentage of variation in total spending increases from 0.054 (column 2) to 0.099 with the inclusion of PCP indicators (column 3). Thus, the percentage of variation in total spending nearly doubles by knowing which primary care physician a patient is attributed to in a given year. Scrolling down the table shows that PCP fixed effects explain significant portions of the variation across patients in physician spending,

PCP spending, specialist spending, office visits, PCP visits, specialist visits, the number of unique diagnoses, and the number of chronic conditions. PCP fixed effects explain less of the variation across patients in pharmaceutical drug spending, post-acute care spending, and the number of ED visits. Nevertheless, when we test for the joint statistical significance of the PCP indicators for each outcome, we find that they are always statistically significant (results not shown).

4.2 Distributions of Changes in PCP Practice Styles Following Exits

Given that PCPs explain significant portions of variation in health care utilization across patients, we now turn to the results showing what happens to patient utilization following PCP exits. Recall that we calculate the change in PCP practice styles by subtracting the old PCP's practice style fixed effect from the new PCP's practice style fixed effect. We have fifteen practice style measures, so we have fifteen changes in PCP fixed effects as well. Table 4 shows some of the distributional moments of the changes in PCP fixed effects. We expect the change in PCP practice styles to be centered around zero, unless for some reason patients systematically seek out higher or lower intensity PCPs following exits. Column 1 shows that the mean is consistently near zero, confirming our hypothesis that some patients switch to more intensive PCPs while others switch to less intensive PCPs. Column 2 shows the standard deviation of the change in each practice style measure, while column 3 shows the change for a patient at the 25th percentile of the distribution and column 4 shows that change in PCP practice styles at the 75th percentile of the distribution. Reading across row 1 reveals that the average patient switched to a PCP with $122 higher total spending (not significantly different from zero), while the patient at the 25th percentile switched to a PCP with $2,158 lower total spending each year (compared to the original PCP), and the patient at the 75th percentile switched to a PCP with $2,376 higher total spending per year (compared to the original PCP). Overall, the table shows that there is significant variation in the PCP practice styles that patients get exposed to following their original PCP exits. Table 4 provides a reference for evaluating the magnitudes of the effects of switching PCPs that we present in subsequent sections.

After a PCP exit, a natural question is how patients select a new PCP. Using provider tax identification numbers, we show that 46% of patients choose a new PCP who belongs to the same group practice as the exiting PCP, and the remaining 54% of patients choose a new PCP belonging to a different group practice. Figure 1 shows how changes in PCP total spending intensity varies across patients who opted for PCPs belonging to the same practice vs. different practices. The red distribution shows that patients who select PCPs belonging to the same practice experience less of a change in their practice style exposure compared to patients who select PCPs belonging to different practices. Thus, more of our identifying variation comes more from patients who opt

to switch physician practices after a PCP exit compared to patients who remain with the same practice.

4.3 First Year Effects of Switching to Higher Intensity PCPs

To explore the effects of PCP practice styles on health care utilization, we focus very narrowly on what happens to patients' health care utilization in the year before the exit and the first year after the exit when patients receive a new physician assignment. Table 5 shows results from our first-differences model. Each cell represents an estimate from a different regression. Cell #1 shows that total spending increases by 49 cents for patients who switch to PCPs with $1 higher total spending. Recalling our model, PCPs have larger effects on patient utilization as the first differenced estimates approach one. With that in mind, PCPs have the largest effects on primary care spending, inpatient spending, outpatient spending, and primary care visits in the year immediately following an exit. They have the smallest effect on pharmaceutical drug spending, possibly because patients are influenced by direct-to-consumer advertising in the US. PCPs also influence the number of diagnose codes that patients have on their records. The number of unique diagnoses increases by 0.49 for patients who switch to PCPs who diagnose their patients with 1 more condition on average. Switching from a PCP at the 25th percentile of the diagnosing distribution to the 75th percentile of the diagnosing distribution means a patient could expect to have $(1.84 - (-1.84)) \times 0.49 = 1.8$ more diagnoses on his/her record the following year. Our result for the number of chronic conditions is similar, but smaller in magnitude: switching from a PCP at the 25th percentile of the chronic condition distribution to the 75th percentile of the distribution translates to $(0.5 - (-0.47)) \times 0.348 = 0.34$ more chronic conditions the following year. These results suggest that PCP assignments can affect the ailments that patients receive treatment for.

4.4 Long Run Effects of Switching to Higher Intensity PCPs

Next we turn to estimating the longer-run effects of switching PCPs on health care utilization, and we examine whether patients who switch to more intensive PCPs exhibit different pre-trends than patients who switch to less intensive PCPs. Figures 2-9 plot our event study estimates for the spending practice style outcomes and Figures 10-16 plot our estimates for the visits and diagnosis outcomes. When patients switch to a PCP with $1 higher spending in any of the eight outcomes in Figures 2-9, health care spending increases the most in the first year (30-80 cents) after the PCP exit, and declines thereafter. The first year effects are the largest and exhibit the largest declines for PCP spending and specialist spending. The first-year and long-run effects are most stable for total physician spending and pharmaceutical drug spending.

Figures 10-16 show a similar pattern for switching to more intensive PCPs as measured by

office visits, PCP visits, specialist visits, ED visits, and diagnostic intensity. When patients switch to PCPs who treat patients with one more visit or one more diagnosis, their own visits or diagnoses increase by 0.4-0.6. There is a jump in the first year effects for some outcomes such as specialist visits, ED visits, and the number of diagnoses, but overall the visits and diagnosis estimates exhibit more long-run stability than the spending estimates.

Now we examine why the effects of switching to higher intensity PCPs are the largest in the first year for many outcomes. Figures 17-22 show event study plots for patients who remained with the same PCP after their initial PCP exited (left panel) and patients who switched PCPs for a second time after their original PCP exited (right panel). We show results for total spending, PCP spending, and the number of chronic conditions. Total spending still exhibits a spike in the first year, but the effects of switching to a higher total spending PCP are higher for patients who remain with that PCP over time (40-60 cent increase in total spending for every $1 increase in a PCP's total spending practice style, compared with 20-40 cent increases for patients who switch).

The differences between patients who remain with the same PCP following an exit vs. those who switch PCPs are much more pronounced for PCP spending. Patients who switch to a PCP with $1 higher PCP spending see their own spending increase by 90 cents, and the estimate declines to 80 cents five years after the original PCP exit. Conversely, patients who switch to a PCP with $1 higher PCP spending, but then later switch PCPs again, see their own spending increase by 60 cents in the first year, but decline to 20 cents five years after the original PCP's exit. For patients who switch PCPs a second time, their PCP spending in the 2-5 years after the original PCP exit is not statistically significantly different from their PCP spending in the 2-5 years before the original PCP exit. These results suggest that patients may associate their PCPs' spending practice style with their PCP's decision-making about care, and they may opt to search for new PCPs if they are unsatisfied with their current PCPs' practice style along this one dimension.

The results for changes in the number of chronic conditions are closer to the results for total spending than for PCP spending. Patients who switch to a PCP who diagnoses 1 more chronic condition, and who remain with that PCP going forward, get diagnosed with 0.4 more chronic conditions in the first year and 0.6 chronic conditions five years out. Patients who switch to PCPs who diagnose 1 more chronic condition, but who switch PCPs again in the future, get diagnosed with 0.3 more chronic conditions in the first year, and the number declines to 0.2 five years out. Thus, there is some persistence in diagnosed chronic conditions for patients with exposure to PCPs who diagnose more intensely, even if the patients later opt to find new physicians.

4.5 Robustness Using Instrumental Variable Method

Despite observing relatively flat pre-trends between patients who switch to PCPs with more vs. less intense practice styles, our empirical strategy does not account for the fact that patient preferences over practice styles may change at the time their PCPs exit. For example, a patient may have been dissatisfied with the number of times his original PCP evaluated him in an office setting, but may have remained with the same PCP for other, unrelated reasons (e.g., convenience). Then when his original PCP relocates or retires, the patient uses the disruption as an opportunity to seek care that aligns better with his preferences. This type of scenario would lead us to overestimate the effects of PCP practice styles on patient utilization.

To address the concern about time-varying patient preferences, we use an instrument that takes advantage of the distribution of PCP practice styles within hospital referral regions. Specifically, our instrument equals the difference between the old PCP's practice style (i.e., fixed effect) and the HRR PCP practice style average. We use this instrument to predict the change in PCP practice styles that patients experience following their original PCP's exit. The intuition is as follows: if the original PCP's practice style was at the high-end of the intensity distribution for the region, then a patient randomly selecting a new PCP would be more likely to select a new PCP with a practice style closer to the region average than a PCP whose practice style was more intensive than the original PCP's style. Similarly, a patient with an original PCP whose practice style was at the lower end of the intensity distribution would be more likely to select a new PCP with a more intense practice style (closer to the average). Using this instrument means that we are isolating more of the variation that comes from patients randomly selecting new PCPs vs. patients opting for PCPs who are more (less) intensive than their originally (less) intensive PCP. Table 6 presents results from our first stage regression testing the relevance of our "mean reversion" instrument. Consistent with our hypothesis, every 1-unit increase in the difference between the old PCP's practice style and the HRR average leads patients to select new PCPs with practice style intensities that are 0.67-0.79 units lower, on average. The instrument is highly significant beyond the 1% level.

Table 7 then compares our first difference estimates to our instrumented first differences estimates for the first year effects of switching to PCPs with more intensive practice styles. In twelve out of fifteen cases, the coefficient estimates decrease by 1-22%, suggesting that our original estimates suffered from moderate amounts of positive selection bias – after an exit, some patients switch to new PCPs whose practice styles better match their preferences. In two out of fifteen cases, our estimates increased by 3-6%, and in 1 case (# disabling conditions), our estimate dropped by 67%. Thus, the amount of positive time-varying selection bias was the largest for practice styles related to the number of disabling conditions diagnosed (-67%), pharmaceutical drug spending (-22%), number of chronic conditions diagnosed (-18%), primary care spending (-14%), and inpatient spending (-14%). Overall though, the share of variation explained by PCP practice

styles remains high at 29-72% for thirteen out of the fifteen practice style measures.

4.6 Demand-side Decomposition

Up to this point, our results have shown how much of the variation in health care utilization is explained by PCP practice style factors. We find that the share varies quite considerably across outcomes and over time, but on average, is about 45%. Next we turn to decomposing the remaining 55% of the variation that is not explained by PCP-related practice styles. To do so, we add a full set of "risk adjusters" in addition to PCP fixed effects to our original empirical model of health care utilization. The risk adjusters include all of the variables listed in Table 1 as well as rarer chronic and disabling conditions affecting less than 1% of the sample. We also include HRR fixed effects. Then we re-estimate our IV results using the "risk-adjusted" changes in PCP practice styles following PCP exits.

The results in Table 8 compare the share of total spending that is explained by PCP practice styles before and after risk-adjusting practice styles with the observable patient characteristics from Table 1. Cell 1 shows that total spending increases by 45 cents for patients who switch to PCPs with $1 higher total spending following an exit, which is the same result presented in Table 7. However, once we risk-adjust the change in total spending practice styles, the estimate increases to 77 cents. The difference between the two estimates suggests that 33% of the variation in total spending across PCPs is accounted for by differences in observable characteristics in their patient populations. Simply put, some PCPs treat sicker patients than other PCPs. The remaining 23% of the variation can then be attributable to patient preferences and unobservable patient health.

The remainder of Table 8 shows that observable patient characteristics explain more of the variation in utilization for some outcomes than others. For example, the PCP spending estimate only increases by 3.4 cents, whereas the outpatient spending estimate increases by 35 cents and the inpatient estimate increases by 24 cents, suggesting that observable patient characteristics explain more of the variation in inpatient and outpatient facility utilization than PCP billing. The pharmaceutical drug spending estimate only increases by 11.5 cents; moreover, the unexplained variation remains high at 67 cents, suggesting that patient preferences and unobservable characteristics play the largest role in pharmaceutical drug spending compared to the other outcomes that we measure.

4.7 Correlations Across Practice Style Measures

Finally, using our risk-adjusted measures of practice style, we estimate correlations across practice style measures and we estimate how switching to a PCP who utilizes more in-office care affects other types of utilization. Table 9 correlates the PCP spending practice style with other practice style measures (column 1) and correlates the PCP visits practice style with other practice

style measures (column 2). Column 1 shows that PCPs who bill for more in-office care also have practice styles that exhibit higher total spending ($\rho = 0.27$), outpatient spending ($\rho = 0.24$), pharmaceutical drug spending ($\rho = 0.56$), and primary care visits ($\rho = 0.24$). The remaining correlations in column 1 are relatively weak, especially the relationships between the PCP spending practice style with inpatient spending ($\rho = 0.03$) and the PCP spending practice style with post-acute care spending ($\rho = 0.03$).

Column 2 of Table 9 shows that the PCP visit practice style measure is generally more correlated with other practice style measures than the PCP spending measure. PCPs who have more evaluation and management visits with their patients have higher physician office spending ($\rho = 0.68$), primary care spending ($\rho = 0.24$), specialist visits ($\rho = 0.34$), and their patients have more diagnoses ($\rho = 0.29$). The PCP visit practice style is uncorrelated with the total spending ($\rho = 0.002$) practice style, and negatively correlated with the inpatient spending ($\rho = -0.11$), post-acute care spending ($\rho = -0.11$), and ED visit ($\rho = -0.08$) practice styles.

Next, Tables 10 and 11 show the degree to which PCP spending and PCP office visits are complements or substitutes for other types of care. Table 10 shows, using the instrumental variables regression framework discussed previously, the first-year effects of switching to a physician with a $100 higher PCP spending practice style (risk-adjusted). Total spending is expected to increase by $44, outpatient spending increases by $29, pharmaceutical drug spending increases by $34, and post-acute care spending decreases by $11. More PCP office visits can be expected, while specialist visits and ED visits decrease, but the effects are very small. Table 11 shows the first-year effects of switching to PCPs whose patients receive 1 more PCP office visit per year. Physician office spending increases by $55, outpatient spending increases by $79, and pharmaceutical drug spending increases by $28. Post-acute care spending decreases by $87, so there is no net increase in total spending. Both PCP and specialist office visits increase and the number of diagnoses and chronic conditions increases, but there is no effect on ED visits. Thus, in-office primary care is a complement with outpatient and pharmaceutical drug spending, is a substitute for post-acute care spending, and is unrelated to inpatient spending or ED visits.

5 Discussion

In this paper, we use fifteen health care utilization measures to characterize primary care physician practice styles. Then we estimate the short-run and long-run effects of switching to PCPs with more "intensive" practice styles (i.e., higher spending, more frequent visits, and diagnostic activity) by using a quasi-experiment focused on patients affected by PCP relocations and retirements. We find that switching to more intensive PCPs affects all practice style outcomes that we measure, where the largest effects occur in the first year of the switch, and for health care utilization mea-

sures most clearly tied to PCP functionalities (e.g., PCP in-office spending, PCP visits, #diagnoses on patient records). PCP practice styles have long-run effects as well, mostly for patients who stay with the same PCP over time, but even for patients who switch PCPs in the future. Thus, we conclude that the practice styles of primary care physicians have far-reaching consequences for patients.

Given the importance of PCP practice styles, policies aimed at measuring practice styles and disseminating that information to patients could help patients make more informed choices. Our results show that the short-run effects of PCP practice styles are larger than the long-run effects, suggesting that patients learn about PCP practice styles through experience and then re-select PCPs when they are less than satisfied. If better information could reduce the "experience good" nature of health care services, then perhaps patients would be more satisfied with their care.

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Table 1: Average patient demographics and health conditions

Beneficiary Characteristics	(1) Beneficiaries Affected by PCP Exits	(2) Beneficiaries Not Affected by PCP Exits
Female	0.59	0.58
Age	76.14	75.64
Black	0.07	0.07
Hispanic	0.02	0.02
Asian	0.02	0.02
Other Race	0.02	0.02
Part A coverage in months	11.73	11.62
Part B coverage in months	11.82	11.65
Buy-in number of months	1.58	1.45
HMO coverage in months	0.24	0.42
Part D coverage in months	6.36	6.24
Part D subsidy in months	2.43	2.45
Dual eligibility in months	1.70	1.57
Disabled and/or ESRD status	0.01	0.02
AMI	0.01	0.01
ADRD	0.08	0.08
Atrial fibrillation	0.09	0.09
Cataracts	0.25	0.23
Chronic kidney disease	0.15	0.14
COPD	0.11	0.11
CHF	0.16	0.15
Diabetes	0.27	0.25
Glaucoma	0.13	0.12
Hip fracture	0.01	0.01
Ischemic heart disease	0.33	0.31
Depression	0.11	0.11
Osteoporosis	0.08	0.08
Rheumatoid arthritis	0.32	0.29
Stroke	0.04	0.04
Breast cancer	0.04	0.03
Colorectal cancer	0.02	0.02
Prostate cancer	0.04	0.04
Lung cancer	0.01	0.01
Anemia	0.24	0.24
Asthma	0.04	0.04
Hyperlipidemia	0.52	0.49
Benign prostatic hyperplasia	0.07	0.07
Hypertension	0.64	0.60
Hypothyroidism	0.11	0.10
Anxiety disorders	0.08	0.07
Bipolar disorder	0.01	0.01
Depression	0.10	0.10
Epilepsy	0.01	0.01
Fibromyalgia	0.08	0.07
Hearing impairment	0.04	0.04
Leukemias and lymphomas	0.01	0.01
Liver disease	0.02	0.03
Migraine	0.01	0.01
Mobility impairments	0.02	0.02
Obesity	0.06	0.05
Peripheral vascular disease	0.12	0.12
Other psychotic disorders	0.02	0.02
Tobacco use disorder	0.04	0.04
Pressure ulcers	0.04	0.04
Sensory blindness	0.01	0.01
N = #Beneficiaries x Years	2,244,799	29,168,400

Notes: Sample summary statistics were derived from the 20% Medicare Master Beneficiary Summary Files and the 20% Carrier claims from 2007-2013. Column 1 shows patient characteristics, Medicare enrollment information, and chronic conditions for patients affected by PCP exits at some point during the sample period. Column 2 shows the same set of means for patients who were never affected by PCP exits during the sample period, but who could be attributed to a PCP using the evaluation and management codes in the Carrier claims.

Table 2: Average patient health care utilization

Health Care Spending	(1) Beneficiaries Affected by PCP Exits	(2) Beneficiaries Not Affected by PCP Exits
Total Spending	$12,159.41	12409.68
Inpatient Spending	$4,940.55	5014.71
Outpatient Spending	$3,359.83	3402.71
Pharma Drug Spending	$1,926.40	1902.11
Post-Acute Care Spending	$1,818.83	1997.4
Physician Office Spending	$646.41	624.61
Primary Care Spending	$334.14	367.01
Specialist Spending	$2,346.92	$2,336.83
Other Utilization & Outcomes		
# Office Visits	8.69	8.48
# Primary Care Visits	4.16	4.23
# Specialist Visits	4.47	4.06
# ED Visits	0.57	0.55
# Diagnoses	14.5	14.36
# Chronic Conditions	3.87	3.68
# Disabling Conditions	0.7	0.66
N = #Beneficiaries x Years	2,244,799	29,168,400

Notes: Sample summary statistics were derived from the 20% Medicare Master Beneficiary Summary Files and the 20% Carrier claims from 2007-2013. Column 1 shows health care spending, visits, and numbers of diagnoses for patients affected by PCP exits at some point during the sample period. Column 2 shows the same set of means for patients who were never affected by PCP exits during the sample period, but who could be attributed to a PCP using the evaluation and management codes in the Carrier claims.

Table 3: Value-added of primary care physician fixed effects

Adjusted R^2	(1)	(2)	(3)	(4)	(5)
Total Spending	0.050	0.054	0.099	0.401	0.420
Inpatient Spending	0.023	0.025	0.065	0.292	0.316
Outpatient Spending	0.013	0.027	0.064	0.250	0.270
Pharma Drug Spending	0.068	0.070	0.108	0.111	0.141
Post-Acute Care Spending	0.060	0.064	0.10	0.299	0.314
Physician Office Spending	0.046	0.104	0.218	0.364	0.431
Primary Care Spending	0.002	0.005	0.176	0.0260	0.187
Specialist Spending	0.008	0.024	0.054	0.192	0.209
# Office Visits	0.031	0.063	0.163	0.298	0.363
# Primary Care Visits	0.031	0.048	0.164	0.160	0.251
# Specialist Visits	0.048	0.076	0.158	0.300	0.353
# ED Visits	0.043	0.045	0.070	0.277	0.292
# Diagnoses	0.041	0.074	0.157	N/A	N/A
# Chronic Conditions	0.131	0.145	0.221	N/A	N/A
# Disabling Conditions	0.060	0.064	0.110	N/A	N/A
Year Fixed Effects	X	X	X	X	X
Patient Characteristics	X	X	X	X	X
Hospital Referral Region FEs		X	X	X	X
PCP Fixed Effects			X		X
Patient Diagnoses				X	X

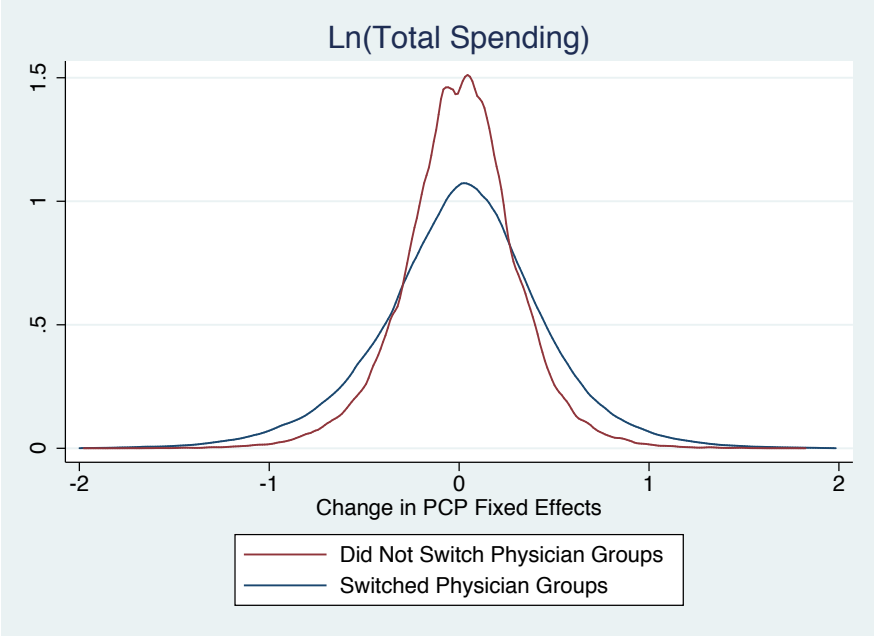
Notes: This table shows how the adjusted R^2 changes across models (columns) of health care spending and utilization (rows), where the different models contain different sets of covariates. Patient characteristics include the variables defined in the top two panels of Table 1. Patient diagnoses include the variables defined in the bottom panel of Table 1 plus rarer conditions defined in the Medicare Chronic Conditions and Disabling Conditions data.

Table 4: Distributional moments of changes in practice styles (Δx_{it})

Distributional Moments	Mean	Std Dev	25th percentile	75th percentile
Total Spending	$122.46	$5,010.61	-$2,158.54	$2,376.19
Inpatient Spending	$61.90	$2,566.68	-$1,099.49	$1,193.14
Outpatient Spending	$10.44	$1,249.63	-$539.83	$559.40
Pharma Drug Spending	$24.10	$1,071.67	-$356.75	$351.20
Post-Acute Care Spending	$19.57	$1,273.72	-$520.16	$565.81
Physician Office Spending	$-6.51	$204.50	-$116.92	$106.38
Primary Care Spending	$37.75	$678.08	-$59.82	$104.75
Specialist Spending	-$10.97	$784.20	-$395.20	$364.86
# Office Visits	-0.12	2.52	-1.44	1.26
# Primary Care Visits	0.02	1.44	-0.67	0.72
# Specialist Visits	-0.14	1.53	-1.01	0.74
# ED Visits	0.00	0.20	-0.11	0.11
# Diagnoses	-0.01	3.17	-1.84	1.83
# Chronic Conditions	0.01	0.79	-0.47	0.50
# Disabling Conditions	0.01	0.24	-0.13	0.14

Notes: This table shows the means, standard deviations, 25th percentiles, and 75th percentiles of changes in the practice style measures for patients affected by PCP exits. The mean changes in practice styles are centered around zero, indicating that approximately half of patients affected by exits switch to PCPs with more intensive practice styles and the other half of patients switch to PCPs with less intensive practice styles. The standard deviations provide information about how much variation the changes exhibit.

Figure 1: Changes in PCP total spending intensity for patients affected by PCP exits



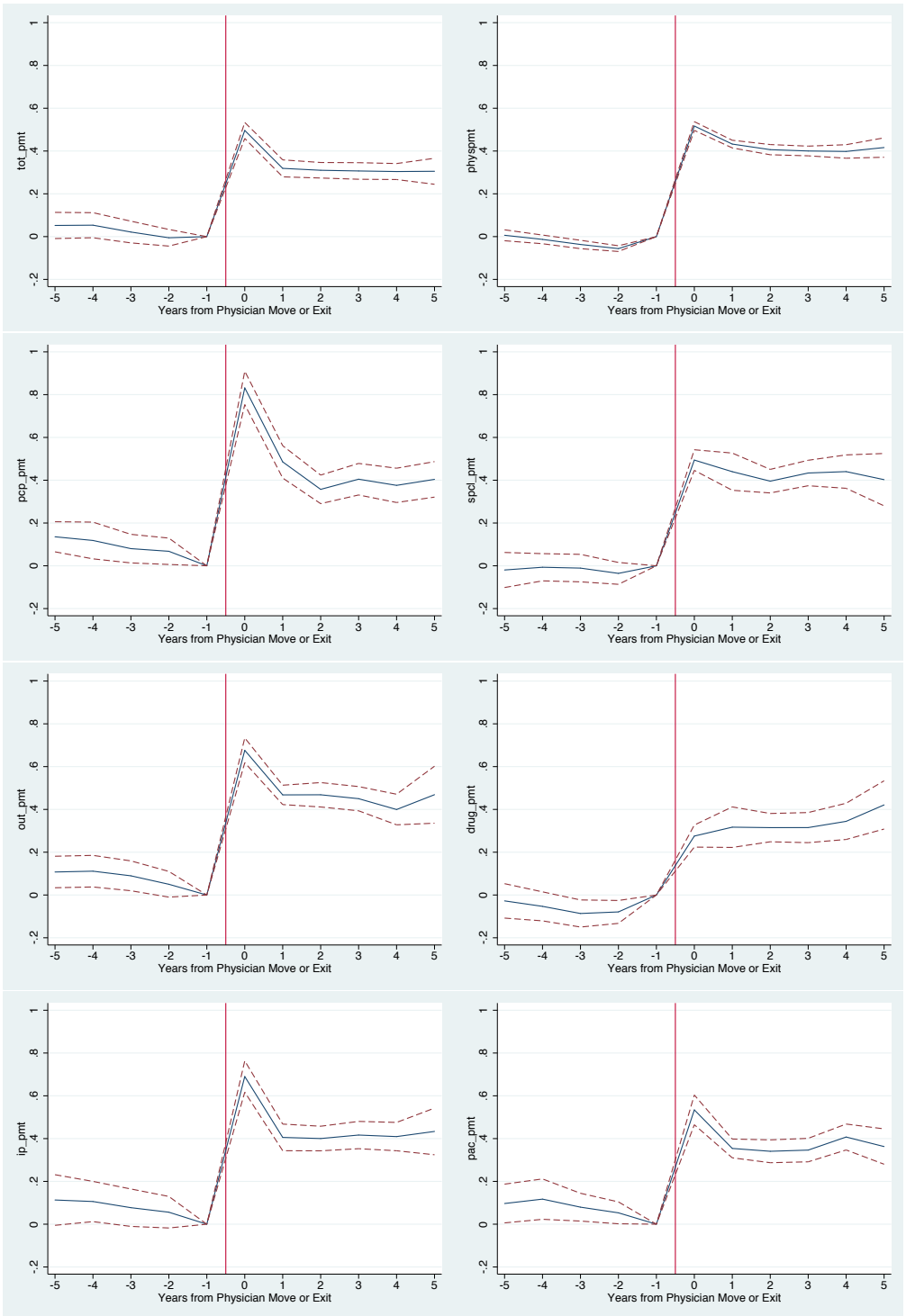
Notes: This figure plots the distribution of the change in Ln(total spending) practice style for patients who switched physician groups following PCP exits (blue distribution) compared to the distribution for patients who remained with the same physician group following an exit (red distribution).

Table 5: First-year effects of switching to PCPs with more intensive practice styles following exits

Patients Affected by PCP Moves	**(1) Δ Total Spending**	**(2) Δ Physician $**	**(3) Δ Primary Care $**	**(4) Δ Specialist $**
Δ PCP Fixed Effect (1-unit change)	0.486*** (0.0162)	0.513*** (0.00972)	0.841*** (0.0327)	0.479*** (0.0194)
	(5) Δ Outpatient $	**(6) Δ Pharma Drug $**	**(7) Δ Inpatient $**	**(8) Δ Post-Acute $**
Δ PCP Fixed Effect (1-unit change)	0.657*** (0.0246)	0.280*** (0.0209)	0.673*** (0.0311)	0.533*** (0.0313)
Patients Affected by PCP Moves	**(9) Δ #Office Visits**	**(10) Δ #PCP Visits**	**(11) Δ #Specialist Visits**	**(12) Δ #ED Visits**
Δ PCP Fixed Effect (1-unit change)	0.474*** (0.00868)	0.619*** (0.0186)	0.553*** (0.00773)	0.536*** (0.0148)
	(13) Δ #Diagnoses	**(14) Δ #Chronic Cond**	**(15) Δ #Disabling Cond**	
Δ PCP Fixed Effect (1-unit change)	0.494*** (0.00690)	0.348*** (0.00493)	0.293*** (0.00680)	

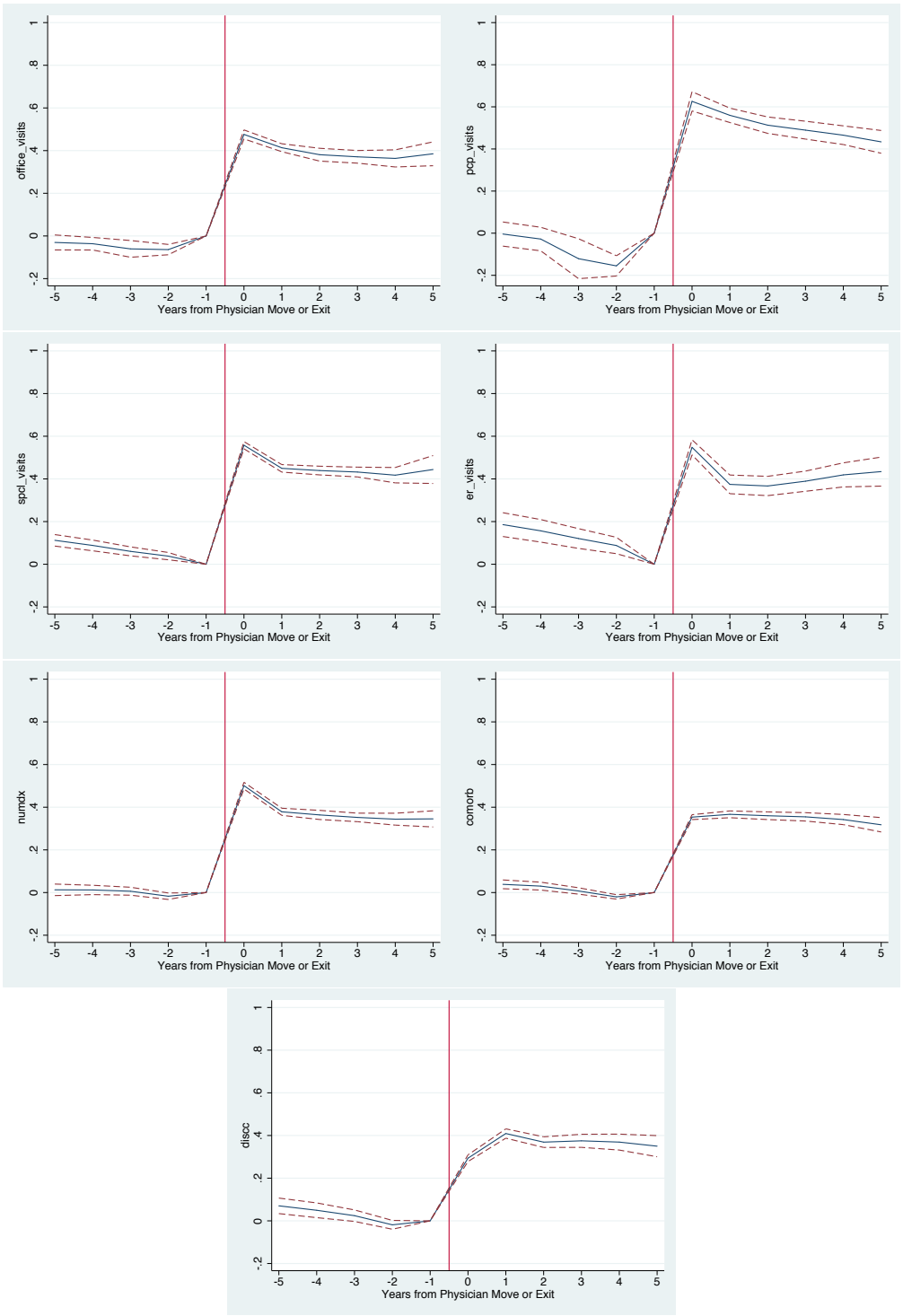
Notes: This table shows the first differenced estimates for the first-year effects of switching to PCPs with 1-unit more intensive practice styles following PCP exits. Each cell is an estimate from a different model that regresses the change in patient outcome on the change in PCP practice style for that outcome. Each models also controls for time-varying patient characteristics and calendar year fixed effects. The standard errors are clustered at the HRR-level. To interpret the first cell, one would say that total spending increases by 45 cents for patients who switch to PCPs with $1 higher total spending practice styles, in the year after their PCPs exit.

Figures 2-9: Effects of switching to PCPs with more intensive spending practice styles ($1 increases)



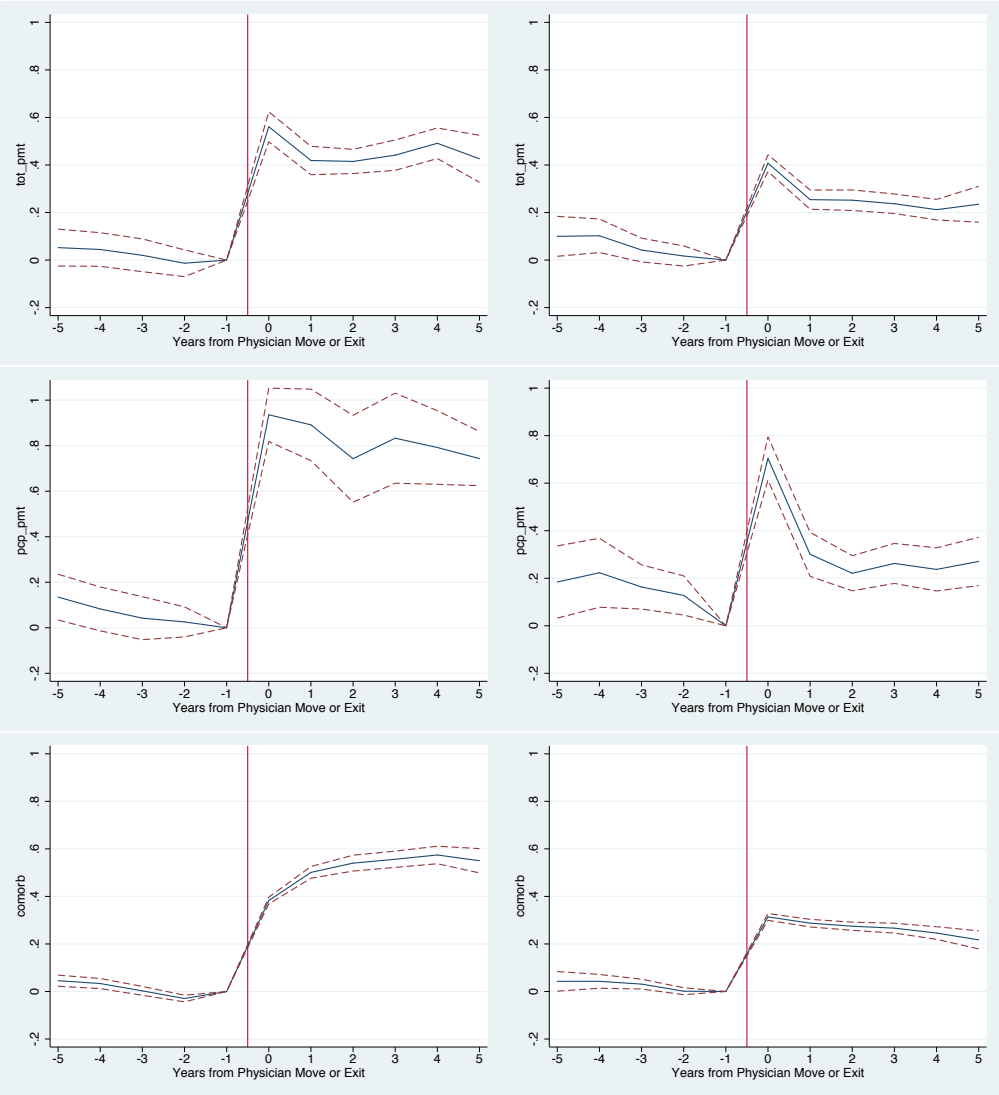
Notes: The figures show the event study estimates for patients who switch to PCPs with $1 more intensive practice styles. $t = 0$ is the first year after the PCP exit when the patient receives a new PCP assignment. $t < 0$ are the years prior to the PCP exit. Reading from left to right, down the page, gives the results for total spending, physician office-based spending, PCP spending, specialist spending, outpatient spending, pharmaceutical drug spending, inpatient spending, and post-acute care spending. The red dotted lines are 95% confidence intervals constructed from standard errors that are clustered at the HRR-level.

Figures 10-16: Effects of switching to PCPs with more intensive utilization practice styles (1-unit increases)



Notes: The figures show the event study estimates for patients who switch to PCPs with 1-unit more intensive practice styles. $t = 0$ is the first year after the PCP exit when the patient receives a new PCP assignment. $t < 0$ are the years prior to the PCP exit. Reading from left to right, down the page, gives the results for numbers of office visits, number of PCP visits, number of specialist visits, number of ED visits, number of unique diagnoses, number of chronic conditions, and number of disabling conditions. The red dotted lines are 95% confidence intervals constructed from standard errors that are clustered at the HRR-level.

Figures 17-22: Comparing patients who remain with their new PCPs (left panel) vs. patients who switch PCPs again after their original PCPs exit (right panel)



Notes: These figures show the event study estimates for two subsamples of patients: those who remain with the same PCP following the original PCP's exit (left panel) and those who switch PCPs after their initial PCP exits (right panel). We present results for these two subsamples for the total spending practice style (top row), PCP spending practice style (middle row), and the number of chronic conditions practice style (bottom row). The red dotted lines are 95% confidence intervals constructed from standard errors that are clustered at the HRR-level.

Table 6: IV first stage results

First stage	Instrument: Old PCP FE - HRR Avg FE		Instrument: Old PCP FE - HRR Avg FE
Δ PCP FE: Total Spending ($)	-0.727***	Δ PCP FE: # Office Visits	-0.670***
	(0.0140)		(0.0267)
Δ PCP FE: Physician Office $	-0.639***	Δ PCP FE: # PCP Visits	-0.729***
	(0.0205)		(0.0149)
Δ PCP FE: Primary Care $	-0.791***	Δ PCP FE: # Specialist Visits	-0.637***
	(0.0167)		(0.0238)
Δ PCP FE: Specialist $	-0.733***	Δ PCP FE: # ED Visits	-0.758***
	(0.0348)		(0.00672)
Δ PCP FE: Outpatient $	-0.749***	Δ PCP FE: # Diagnoses	-0.667***
	(0.0257)		(0.0277)
Δ PCP FE: Pharma Drug $	-0.675***	Δ PCP FE: # Chronic Conditions	-0.685***
	(0.0395)		(0.0108)
Δ PCP FE: Inpatient $	-0.764***	Δ PCP FE: # Disabling Conditions	-0.710***
	(0.00778)		(0.0159)
Δ PCP FE: Post-Acute Care $	-0.723***		
	(0.0235)		

Notes: This table presents the first stage results for using the mean reversion instrument to predict the changes in PCP practice styles that patients get exposed to after their original PCP exits. Each cell represents an estimate from a different regression of the change in PCP practice style outcome (Y) on the mean reversion instrument related to Y. Standard errors are clustered at the HRR-level and appear in parentheses.

Table 7: First-year effects of switching PCPs due to exits: First differences vs. IV results

	FD	FD+IV	% Change
Total Spending ($)	0.485***	0.445***	-8%
	(0.0162)	(0.0377)	
Physician Office $	0.513***	0.469***	-9%
	(0.00973)	(0.0109)	
Primary Care $	0.841***	0.720***	-14%
	(0.0327)	(0.0477)	
Specialist $	0.479***	0.593***	24%
	(0.0194)	(0.0415)	
Outpatient $	0.657***	0.699***	6%
	(0.0246)	(0.0688)	
Pharmaceutical Drug $	0.280***	0.219***	-22%
	(0.0209)	(0.0392)	
Inpatient $	0.673***	0.581***	-14%
	(0.0311)	(0.0576)	
Post-Acute Care $	0.529***	0.524***	-1%
	(0.0312)	(0.0565)	
# Office Visits	0.473***	0.488***	3%
	(0.00869)	(0.0131)	
# PCP Visits	0.619***	0.553***	-11%
	(0.0186)	(0.0350)	
# Specialist Visits	0.552***	0.506***	-8%
	(0.00773)	(0.0184)	
# ED Visits	0.534***	0.513***	-4%
	(0.0148)	(0.0286)	
# Diagnoses	0.494***	0.481***	-3%
	(0.00690)	(0.0112)	
# Chronic Conditions	0.348***	0.285***	-18%
	(0.00492)	(0.00876)	
# Disabling Conditions	0.293***	0.0962***	-67%
	(0.00681)	(0.0137)	

Notes: This table compares the first differenced results from Table 5 to the results we obtain by using the mean reversion instrument. The third column shows how much the original first-differences estimate changes, in percentage terms. Standard errors are clustered at the HRR-level and appear in parentheses.

Table 8: Decomposing demand-side variation by risk-adjusting PCP practice styles

Patients Affected by PCP Moves	**(1) Δ Total Spending**	**(2) Δ Total Spending**	**(3) Δ Physician $**	**(4) Δ Physician $**
Δ PCP Fixed Effect	0.445***	0.772***	0.469***	0.675***
(1-unit change)	(0.0377)	(0.0696)	(0.0109)	(0.0148)
Risk-adjusted	No	Yes	No	Yes
	(5) Δ Primary Care $	**(6) Δ Primary Care $**	**(7) Δ Specialist $**	**(8) Δ Specialist $**
Δ PCP Fixed Effect	0.720***	0.754***	0.593***	0.904***
(1-unit change)	(0.0477)	(0.0501)	(0.0415)	(0.0720)
Risk-adjusted	No	Yes	No	Yes
	(5) Δ Outpatient $	**(6) Δ Outpatient $**	**(7) Δ Pharma Drug $**	**(8) Δ Pharma Drug $**
Δ PCP Fixed Effect	0.699***	1.049***	0.219***	0.334***
(1-unit change)	(0.0688)	(0.118)	(0.0392)	(0.0535)
Risk-adjusted	No	Yes	No	Yes
Patients Affected by PCP Moves	**(9) Δ Inpatient $**	**(10) Δ Inpatient $**	**(11) Δ #PCP Visits**	**(12) Δ #PCP Visits**
Δ PCP Fixed Effect	0.581***	0.835***	0.553***	0.667***
(1-unit change)	(0.0576)	(0.0913)	(0.0350)	(0.0439)
Risk-adjusted	No	Yes	No	Yes
	(13) Δ #Specialist Visits	**(14) Δ #Specialist Visits**	**(15) Δ #Diagnoses**	**(16) Δ #Diagnoses**
Δ PCP Fixed Effect	0.506***	0.694***	0.481***	0.556***
(1-unit change)	(0.0184)	(0.0233)	(0.0112)	(0.0122)
Risk-adjusted	No	Yes	No	Yes

Notes: This table compares our IV estimate from Table 7 to the estimate that we obtain if we risk-adjust the original PCP practice style measures using the observable patient characteristics and health conditions listed in Table 1. We interpret the difference between the two estimates as the share of total variation explained by observable patient characteristics. We interpret the difference between one and the risk-adjusted estimate as the share of total variation explained by unobservable patient characteristics and/or preferences. Standard errors are clustered at the HRR-level and appear in parentheses.

Table 9: Correlations between PCP spending, PCP visits, and other measures of practice style

Correlations	PCP Fixed Effect (FE) Primary Care Spending	PCP Fixed Effect (FE) Primary Care Visits
PCP FE: Total Spending	0.27	0.002
PCP FE: Physician Office Spending	0.15	0.68
PCP FE: Primary Care Spending	1.00	0.24
PCP FE: Specialist Spending	0.10	0.16
PCP FE: Outpatient Spending	0.24	0.19
PCP FE: Pharmaceutical Drug Spending	0.56	0.14
PCP FE: Inpatient Spending	0.03	-0.11
PCP FE: Post-Acute Care Spending	0.03	-0.11
PCP FE: # Office Visits	0.11	0.79
PCP FE: # Primary Care Visits	0.24	1.00
PCP FE: # Specialist Visits	-0.07	0.34
PCP FE: # ED Visits	-0.04	-0.08
PCP FE: # Diagnoses	0.10	0.29
PCP FE: # Chronic Conditions	0.05	0.13
PCP FE: # Disabling Conditions	0.09	0.09
N = #Beneficiaries x Years	2,273,045	2,273,045

Notes: This table shows the pairwise correlations between the risk-adjusted PCP total spending fixed effects and other practice style measures (column 1) as well as the pairwise correlations between the risk-adjusted PCP number of visits fixed effects and other practice style measures. These correlations are only presented for the sample of patients affected by PCP exits.

Table 10: First-year effects of switching to a physician with $100 higher PCP spending

IV Risk-Adjusted Results	**Δ PCP FE: Primary Care $**		**Δ PCP FE: Primary Care $**
Δ Total Spending ($)	44.11*	Δ #Office Visits	0.024***
	(17.31)		(0.006)
Δ Physician Office $	2.23***	Δ #PCP Visits	0.026***
	(0.432)		(0.004)
Δ Specialist $	-24.38***	Δ #Specialist Visits	-0.013***
	(6.133)		(0.003)
Δ Outpatient $	28.86***	Δ #ED Visits	-0.002**
	(4.839)		(0.0007)
Δ Pharma Drug $	34.26***	Δ #Diagnoses	-0.007
	(7.644)		(0.007)
Δ Inpatient $	-8.691	Δ # Chronic Conditions	-0.004***
	(11.74)		(0.001)
Δ Post-Acute Care $	-10.53*	Δ #Disabling Conditions	-0.0004
	(4.723)		(0.0004)

Notes: This table shows how switching to a physician with $100 higher (risk adjusted) PCP spending practice style affects other components of health care utilization. We use the IV first-differences model to estimate the effects. Standard errors are clustered at the HRR-level and appear in parentheses.

Table 11: First-year effects of switching to a physician with 1 more PCP visit

IV Risk-Adjusted Results	Δ PCP FE: PCP Visits		Δ PCP FE: PCP Visits
Δ Total Spending ($)	4.869	Δ #Office Visits	0.911***
	(78.50)		(0.0393)
Δ Physician Office $	55.87***	Δ #PCP Visits	0.667***
	(2.359)		(0.0439)
Δ Specialist $	57.25***	Δ #Specialist Visits	0.349***
	(16.09)		(0.0252)
Δ Outpatient $	78.93***	Δ #ED Visits	0.00109
	(23.50)		(0.00323)
Δ Pharma Drug $	28.42*	Δ #Diagnoses	0.377***
	(12.87)		(0.0365)
Δ Inpatient $	-14.94	Δ # Chronic Conditions	0.0315***
	(44.24)		(0.00557)
Δ Post-Acute Care $	-87.23***	Δ #Disabling Conditions	-0.00309
	(25.55)		(0.00267)

Notes: This table shows how switching to a physician with a 1-unit higher (risk adjusted) PCP office visit practice style affects other components of health care utilization. We use the IV first-differences model to estimate the effects. Standard errors are clustered at the HRR-level and appear in parentheses.