The Value of Relationships in Health Care*

Adrienne Sabety

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Abstract

I establish the economic relevance of long-term relationships between patients and doctors. Relationships determine where patients demand care and are moderately important for patients' health. After a primary care physician's (PCP's) departure, patients' preference for relationships leads to a less efficient provision of primary care, increasing both public and private costs. The effect is driven by relationships growing over time and plausibly containing health-specific information. I also find that managing clinics as teams minimizes patients' reliance on a *specific* relationship. When a PCP moves 50 miles away, 53% of patients follow, providing a lower bound on patients' valuation of relationships.

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1 Introduction

"It is more important to know what sort of person has a disease than to know what sort of disease a person has."–Hippocrates

Patients value having a relationship with their physician. This could be partially due to the long-term nature of relationships: 65% of adults have seen their doctor for more than three years (Baker et al., 2003). Relationships between patients and doctors may also improve the efficiency of the health care system. For instance, primary care physicians (PCPs), the focus of this paper, are widely considered the building blocks of the health care system, coordinating patient care across specialists and referring patients to downstream care (Starfield, 1994).

Despite the perceived importance of relationships, their economic relevance remains unclear. On the one hand, longstanding relationships may be a function of convenience, price, and quality. Physicians and, in particular, PCPs provide a standardized good in a market characterized by extensive use of information technology and firms with far-ranging scope and scale (Goldin and Katz, 2016). Indeed, retail clinics, price comparison tools, and insurance networks are commonplace in health care markets. On the other hand, patients may benefit more from seeing known PCPs. This benefit may be psychological, such as having a racially concordant relationship (Alsan, Garrick and Graziani, 2019), or directly related to patients' health, as arguments for greater continuity of care suggest (David and Kim, 2018; Agha, Frandsen and Rebitzer, 2019).

In order to estimate the economic relevance of PCP-patient relationships, I implement a quasi-experimental framework to quantify how Medicare patients are impacted by the retirement or far-away relocation of a longstanding PCP. I identify the causal effect in a difference-in-differences research design, using a matched control group of PCPs who did not exit but are otherwise similar to exiting PCPs. For identification, I assume that PCPs depart for idiosyncratic reasons unrelated to the health of their patients. Outcomes of treated and control patients trend similarly 1-2 years before the exit, supporting this assumption.

I find that relationships determine where patients' demand care and are moderately important for patients' health. In response to severing a longstanding PCP-patient relationship, patients are 17% less likely to visit the primary care setting for at least four years after the exit. Instead, patients substitute to specialists with whom they already *had a relationship* for primary care, leading to a less efficient provision of primary care long-term. Adverse events—i.e. emergency department (ED) and inpatient admissions—also increase for one year after a PCP's exit. Patients' substitution away from primary care leads patients to spend \$3,761 and Medicare to spend \$33,776 additional dollars, per exiting PCP.[1]

I explain the impact of a PCP's exit by showing that patients receive more benefit from seeing PCPs they know. First, I find that relationships build over time and likely contain health-specific information. Patients with longer PCP relationships are more likely to substitute away from replacement PCPs to known specialists after a PCP's exit. Patients with longer relationships are also marginally more likely to have an adverse event.

Second, patients who are more familiar with replacement PCPs are less impacted by the loss of a *specific* relationship. I use plausibly exogenous variation in management practices to compare patients in clinics that work as a team, clinics that care for patients one-on-one, and clinics that close when a PCP exits. I find that patients in team clinics are the most likely to stay at the main PCP clinic and are the least likely to substitute to specialists for primary care and to have an adverse event. These effects increase as patients are increasingly less likely to know replacement PCPs at the clinic. As a result, patients seem to view replacement PCPs as most interchangeable in clinics that practice as a team, followed by one-on-one clinics, and, lastly, closing clinics.

Third, I focus on a separate set of close moves where patients can follow a PCP to a new clinic or continue to seek care with a replacement PCP at the original clinic. I show that 53% of patients choose to follow a PCP who moves 50 miles from the patient's zip code of residence.[2] Patients with the longest quartile of relationship, 14-17 years, are 10 percentage points (pp) more likely than patients with the shortest quartile of relationship, 2-5 years, to drive an additional 50 miles one-way to follow their PCP. Further, patients in individual clinics are 14 pp more likely than patients in team clinics to follow their PCP.

The evidence thus far suggests that patients receive more benefit from seeing PCPs they

[1] My findings complement work using exits to identify practice styles in the primary care context (Fadlon and Parys, 2020 and Kwok, 2019) as well as work looking at the short-term, aggregate impact of a PCP's exit across various types of patients (e.g. Sabety, Jena and Barnett (2020), Staiger (2018), Bischof and Kaiser (2018), Simonsen et al. (2019), and Zhang (2018)).

[2] The number of patients moving with PCPs is especially large considering that 39 states enforce non-compete agreements (Hausman and Lavetti, 2016).

know. To ensure my interpretation is right, I explore four alternative explanations, finding that none match the evidence. First, patients may decrease their use of primary care because they are unable to find a replacement PCP that is a similarly good match (Jovanovic, 1979*b*). I show that primary care visits decrease similarly among patients with more specific needs, i.e. high risk, disabled, dual eligible, minority as well as female patients with female PCPs. Therefore match quality along these dimensions does not appear to be a main mechanism. Second, replacement PCPs may be hard to find. I do not find support for this by showing that patients in thinner and thicker markets decrease their use of primary care similarly. Third, the loss of a PCP may overwhelm staying PCPs at the main clinic by increasing their workload. I find that staying PCPs *do* take on more patients after a PCP's exit, but that the outcomes of staying PCPs' patients are not affected. Further, patients in smaller clinics are only slightly more likely to substitute away from the main clinic, while the increased workload for PCPs who work in small clinics is relatively larger.[3] Fourth, I show that replacement PCPs do not refer to specialists at a higher rate than departing PCPs. Therefore, practice pattern differences between replacement and leaving PCPs do not explain why patients decrease their use of primary care and increase their use of specialty care after a PCP's exit.

The paper proceeds as follows. Section 2 describes how the data is constructed. In Section 3, I describe my empirical strategy and identification assumptions. Section 4 presents the main results. Section 5 explores the specific mechanisms behind the aggregate results. Section 6 explores alternative explanations for results. Section 7 concludes.

2 Data Construction

2.1 Data Sources

All analyses rely on a 20% sample of Medicare patients from 2002-2017, encompassing all health care encounters paid by Medicare for about 11 million patients. Claims start when

[3]Similarly, prior work has shown that outside, replacement workers are imperfect substitutes for incumbent workers (e.g. Jäger (2017); Stole and Zwiebel (1996)). I extend this literature by illustrating that, while the workload of incumbent workers increases in response to the loss of a co-worker, this does not observably affect incumbent workers' productivity. I also show that, even if a firm can perfectly substitute between workers, clients themselves may not view workers as substitutes because of the existence of the relationship.

patients become eligible for Medicare (typically age 65) and end when patients die or enroll in Medicare Advantage (MA). The data also includes a rich set of patient demographics, such as sex, age, race, and zip code of residence.

Identifying clinics, also known as the doctor's office, is a novel contribution of the paper. Medicare data does not contain a clinic identifier, so I construct my own by combining the tax identification number (TIN) and nine-digit zip code (ZIP) associated with the claim. The drawback to this definition is that different clinics located within the same facility may be considered the same. I therefore exclude clinics with over 100 PCPs because larger "clinics" are more likely to include multiple clinics.[4] This restriction also increases the probability that the treatment group has a common support.[5] Non-US clinics are also excluded because of different institutional contexts.

The data also contain about one million health care providers. Medicare data is ideal for studying the health care workforce because it contains a nearly nationally representative sample of clinics and providers: 93% of American PCPs accept Medicare (Boccuti et al., 2015). Further, all providers are uniquely identified by National Provider Identifiers (NPIs), a universal identifier used to submit billing claims.

I supplement the Medicare data with four other data sources by linking across NPIs: the National Plan and Provider Enumeration System, Doximity, Medicare's MD-PPAS, and Physician Compare. This allows me to identify providers' specialty, sub-specialty, sex, age, type of training, and whether NPIs belonged to individuals or organizations.[6] PCPs include providers with a specialty of family medicine, general practice, geriatric medicine, internal medicine, preventive medicine, pediatrics (many of whom have board certifications in internal medicine), or obstetrics and gynecology (commonly used as PCPs by women).

[4]This excludes large organizations like the Cleveland Clinic, Kaiser, and Intermountain.

[5]Larger clinics are mechanically more likely to have departures, so large control clinics without departure are rare. For example, almost all clinics with over 100 PCPs experience a departure within a three year window.

[6]Analyses drop organization NPIs. Table A1 illustrates the algorithm used for each year of data.

2.2 Primary Variable Construction

My identification strategy relies on being able to accurately define when a PCP leaves a clinic. I define a **departure** to occur when a PCP fully disappears from the data or relocates. Full disappearances occur at an average age of 59 (median 61), suggesting that these exits are retirements. **Relocations** occur when a PCP moves to a new clinic at least 100 miles from the original clinic. I also identify cases where a PCP's departure is followed by the clinic's closing, which occurs in 27% of cases. (See Appendix A.1 for more details.)

Main outcomes include utilization of clinic based services and quality of care. Primary care, specialty, and urgent care visits encompass utilization of clinic based services, where changes in these outcomes have an ambiguous effect on patient health. I classify new and existing patient visits using evaluation and management (E&M) billing codes. E&M visits include annual exams, wellness visits, physician exams, and consultations.[7] A major advantage to E&M codes is that patients are only considered new if they have not seen that physician or another physician of the same specialty within the previous three years, in the same clinic. This allows me to more cleanly identify the demand side (e.g. patients seeking out new relationships) opposed to supply side changes (e.g. patients being transferred to replacement PCPs within the clinic).

Of all primary care visits, about 75% are for E&M visits and, of these, 96% are for existing patients and 4% are for new patients. Comparatively, E&M visits are much less common in the specialty setting. Specialists bill for E&M visits 24% of the time and, of these, 12% are for new patients and 84% are for existing patients. Therefore, E&M codes billed by specialists may not capture the complete picture, whereas those billed by PCPs likely do.

Quality of care metrics include adverse events, preventive care, and medications. Adverse events include death, emergency department (ED) visits, and inpatient admissions. I classify primary care treatable ED visits using an algorithm developed by Billings, Parikh and Mijanovich (2000) and updated by Johnston et al. (2017). Preventive care includes influenza

[7] New patients are patients who did not receive any professional services from the physician (or non-physician) or another physician of the same specialty in the same group practice within the previous 3 years. Existing patients are individuals who received care from the physician (or non-physician) or another physician of the same specialty in the same group practice within the previous three years. CMS' coding rules can be found here: https://www.cms.gov/Outreach-and-Education/Medicare-Learning-Network-MLN/MLNProducts/Downloads/eval-mgmt-serv-guide-ICN006764.pdf

(flu) vaccines, annual exams, and preventive screens.[8] Preventive screens include mammography screens, colorectal cancer screens, cholesterol screens, and diabetes screens.[9,10] The medication category includes the total number of medications and the 40% of medications that are chronic medications. See Appendix A.1 for details.

The **length of PCP-patient relationships** begins the first time I observe the patient seeing the PCP and ends the month before relative time zero ($t = -1$), or the month of the main PCP's departure. I count any visit within a year as a point of contact.[11] I do not consider patients under age 75 (as of $t = -36$) when doing comparisons by the length of the relationship. I do this to circumvent left censoring because I only observe patients when they become Medicare eligible at age 65. The restricted sample of patients is on average 81 years old, or 10 years older than patients in the main sample (See Table A12).

The number of PCPs seen by patients is confounded with patients' health, which makes defining whether a clinic is managed as **a team or a one-on-one model** potentially endogenous to patients' health status. For instance, sicker and older patients are more likely to see multiple providers than healthier and younger patients. To circumvent this endogeneity, I define management practices at the clinic-level using all patients who visit a clinic within the first 12 months the clinic is observed in the data. I then restrict to patients who had three E&M visits over this 12 month period and categorize whether the three visits were with the same PCP. I then take the average rate over the clinic of how many patients exclusively saw one PCP, calling clinics above the average "individual clinics" and those below the average "team clinics." I find that 59% of clinics were on individual models, where 58% of patients were seen by the same PCP for their first three E&M visits.

[8]Obtaining a yearly flu vaccine is considered a key input into patient health, especially among the elderly. In spite of this, many patients do not receive a yearly flu vaccine. For instance, the Centers for Disease Control and Prevention reported that 59.6% of adults over age 65 received a flu vaccine during the 2017-2018 flu season (CDC, 2018).

[9]The rate of mammograms includes the total number of mammograms within a PCP's pool of patients divided by the number of *women* in that PCP's patient pool.

[10]Preventative care was identified from the carrier file's Health care Common Procedure Coding System codes based on a crosswalk used by Centers for Medicare and Medicaid Services to categorize quality scores for Accountable Care Organizations (ACO) in the domain of preventative health. https://www.cms.gov/Medicare/Prevention/PrevntionGenInfo/medicare-preventive-services/MPS-QuickReferenceChart-1.html

[11]Patients are categorized as having a long relationship regardless of the frequency of the interaction between the first contact and the month before relative time zero, potentially biasing estimates towards zero. For instance, if a patient saw a PCP once 7 years ago, I would categorize their relationship as lasting 7 years. This is a more tenuous link than a patient who has seen their PCP yearly for 10 years.

I also categorize the **local density of PCPs** as the thickness of the local PCP market. The local density of PCPs is defined as the number of PCPs filing billing claims within a 30 mile radius of each focal clinic ZIP divided by the population.[12]

I use four different patient level definitions: **risk**, **disability**, **racial status**, and **dual eligibles (DEs)**. I define a patient's risk level using their calculated Elixhauser Index, which creates an index using diagnosis codes that are predictive of death. I use diagnosis codes three years before the departure to circumvent the potential endogeneity of patient outcomes to treatment.[13] High risk patients have Elixhauser scores in the top quartile of a PCP's pool of patients. Disabled patients have spinal cord injuries, blindness, mobility impairments, muscular dystrophy, chronic pain fatigue/fibromyalgia, spina bifida, multiple sclerosis, or cystic fibrosis. I use the race variable in the Master Beneficiary Summary File to classify race. The DE variable in the Master Beneficiary Summary File classies whether or not patients are dually eligible for Medicaid.

2.3 Sample Restrictions

The creation of the PCP sample avoids three main issues. First, I restrict to PCPs who saw more than 30 total patients from $-36 \leq t < -24$ to ensure I am not missing departures due to the 20% nature of the Medicare sample.[14] Once I condition on seeing 30 patients, treatment PCPs see on average 130 patients (median 88) and control PCPs see on average 156 patients (median 115) from $-36 \leq t < -24$. This sample yields a departure rate of 11% from 2005 to 2016 (Table A2). See Appendix A.2 for more details on departures.

Second, I construct relative time for the control group by matching control and treatment PCPs in month $t = -36$, or 36 months before a PCP's exit.[15] Third, compositional changes in the number and types of patients seen around a PCP's departure may affect identification. For instance, PCPs may transfer sicker patients to replacement PCPs before healthier

[12] A 30 mile radius was chosen because patients travel 17 miles on average to their assigned clinic, which was defined to be patients' modal clinic. The distance between five digit zip codes were great-circle distances calculated using the Haversine formula based on internal points in the geographic area. The data set was obtained from the NBER at https://www.nber.org/data/zip-code-distance-database.html.

[13] I then aggregate these individual scores, which I use as my measure of riskiness.

[14] I choose 30 as the cut-off because treatment PCPs see 67 total patients on average (median 26) and control PCPs see 32 total patients on average (median 0) in the *unrestricted* primary care sample.

[15] Control PCPs practicing in clinics experiencing a departure do not enter the control sample.

patients (or vice versa). To address this, I use a sample of PCPs practicing three years before the departure. I then assign patients to PCPs 2-3 years before exit to circumvent the endogeneity of visits around the departure.

3 Empirical Strategy

I implement a difference-in-differences (DD) design where I match 16,646 PCPs who left a physician group in a given month-year to a comparison group of 16,646 PCPs with similar lagged characteristics, that did not retire or relocate. I then analyze the effect of the departure using 965,939 patients associated with either control or treatment PCPs.

3.1 PCP Matching Procedure to Select Comparison Group

Departing and staying PCPs may be different along at least three dimensions. First, departing PCPs are 0.4 years older than staying PCPs on average (Figure A1a). Second, the rate of departure as well as practice styles may differ by a PCP's gender and training (e.g. nurse practitioner (NP), physician assistant (PA), or medical doctor (MD)). Third, the physician workforce is in the midst of a burnout crisis and a growing number of PCPs are leaving clinical practice due to large and growing caseloads (Sabety, Jena and Barnett, 2020).

To adjust for these differences, I coarsen exact match observably similar treatment and control PCPs one-to-one, three years before the departure.[16] I match exactly on month-year of calendar time, which enables me to derive a relative time measure for control PCPs and their associated patients. I also match exactly on PCP sex and the type of PCP (i.e. NP, PA, or MD) as well as four coarsened bins of PCP age in $t = -36$ and 10 coarsened bins of the number of patients seen. I intentionally match on time invariant covariates to address the potential for mean reversion, with one exception: the lagged number of patients seen in $t = -36$. Matching on the lagged number of patients is important because PCPs who see large volumes of patients may be more likely to leave practice than PCPs who see fewer patients, which in turn could affect patient outcomes.

[16] I use coarsened exact matching following recent literature (e.g. Jäger, 2017; Jaravel, Petkova and Bell, 2018; Sarsons, 2017; Azoulay, Zivin and Wang, 2010). See Table A3 for each restrictions relative weight.

I then assign patients to PCPs based on their modal number of E&M visits 2-3 years before the departure. I use E&M visits for the assignment in order to isolate visits made to a patient's PCP as opposed to secondary staff.[17,18] A similar procedure was used to define the clinic-level sample detailed in Appendix B.

3.2 Summary Statistics

Table 1 describes summary statistics for PCPs and patients by treatment status. Comparing treatment and control group means, standard deviations, and normalized differences confirms that the matching procedure created a balanced comparison group.[19]

Match Rate. The first section of Table 1 illustrates the match rate and resultant sample size. Of treated PCPs that meet the sample restrictions, 78% are matched, leading to a sample of 16,646 control and 16,646 treatment PCPs. This translates to 454,527 treated patients and 511,412 control patients, or 90,062,522 PCP-patient-time observations. The strongest restriction is exactly matching on the PCP's training (Table A3).

PCP Matching Covariates. The second panel shows the matching covariates defining the coarsened bins. Treated PCPs are about one year older than control PCPs and caseload is not significantly different between groups. In addition to PCP age and caseload, which are displayed in Table 1, the PCP's training (NP, PA, or MD), PCP gender, and month-year of calendar time are exactly matched on.

Patient Covariates by Treatment Status. The third section of the table shows that treated and control patient characteristics are broadly similar. The largest difference is the number of providers seen by treated and control patients. Treated patients see slightly more PCPs (2.5 v. 2.0) and specialists (4.5 v. 4.8). This suggests that the loss of a PCP may impact treated patients slightly less than control patients, had they also lost a PCP.

[17]Section 2.2 provides additional details on E&M visits.

[18]This allocation method follows the standard in the literature (Pollack et al., 2016). If a patient is assigned to a PCP that is not in the matched sample, that patient and matched PCP-patient pair is excluded from analyses.

[19]Normalized differences over 0.30 are considered large and economically significant (Imbens, 2015).

3.3 Estimating Equations and Identification

I estimate the causal impact of a PCP's departure on patient outcomes using an event study, difference-in-differences design. Equations are of the form:

$$y_{jt} = \rho_{m(j)} + \sum_{\tau=-24}^{12} \beta_\tau \times \mathbf{1}(t=\tau) + \sum_{\tau=-24}^{12} \beta_\tau^{Treated} \times \mathbf{1}(t=\tau) \times Treated_j + \epsilon_{jt} \qquad (1)$$

where y_{jt} denotes the average outcomes over PCP j's pool of patients in relative time t. $\mathbf{1}(period_t)$ includes relative time t fixed effects. $\rho_{m(j)}$ are PCP fixed effects, which absorb average differences across PCPs.[20] I cluster the standard errors at the pre-departure PCP-match level to account for idiosyncratic factors that are specific to a matched pair. This assumes that the errors of matched pairs are uncorrelated. As outlined in Section 2.3, I restrict the data to support the plausibility of this assumption. Identification relies on comparing outcomes within a PCP's group of patients to the matched control PCP's pool of patients, relative to the omitted time group.

For *event study graphs* that follow patients one year post-departure, t is the month-year relative to the departure at $t = 0$. The coefficient of interest, $\beta_t^{Treated}$, captures the effect of a departure in month-year t and is normalized to zero in $t = -24$.

Regressions are at the relative year level, relative to $-2 \leq t < -1$, allowing for anticipation up to one year before a PCP's exit.[21,22] Visually inspecting event study graphs supports this assumption. The main results use a sample that follows patients for one year post-departure unless otherwise specified.

[20] As a robustness check, I estimate main results with PCP-match fixed effects and estimate the main specification clustering at the firm level. Both yield similar results.

[21] I start at the patient level and sum over patient i's y_{ijt}s within a PCP's pool of patients. I then normalize this outcome by the number of patients in each PCP's pool, summing over the monthly PCP level averages of each outcome to get the yearly rate. To obtain estimates representative of the original patient population, frequency weights are used in all regressions. Regressions are run at the PCP-year level.

[22] Specifications using more than one year post-exit include a dummy for each year relative to treatment, interacted with treatment status.

4 Aggregate Impact of the Loss of a PCP on Patients

This section shows how patients' utilization of exiting PCPs and clinics are affected by a PCP's exit. I show outcomes in Section 4.1 and the specific mechanisms behind these results in Section 5.

Figure 1a and 1b illustrate the identifying variation. Graphs plot the average number of visits to assigned PCPs and clinics over relative time t for one year post-departure. For instance, if the average number of primary care visits per month is 0.3, patients visit their main PCP slightly more than three times a year. Blue triangles represent control patients and red crosses represent treated patients. Patients are assigned to PCPs from $-36 \leq t < -24$, $t = -24$ marks the start of the treatment period, and $t = 0$ marks the last month exiting PCPs see patients.[23] Treated and control patients do not visit their main PCP at the same rate because treated patients see slightly more PCPs than control patients (Table 1).

Figure 1a shows that, after a PCP exits in $t = 0$, patients no longer see that PCP for primary care. Treated and control patients see assigned PCPs at the same rate, as illustrated by the curves moving in parallel. Both curves slope downward due to mean reversion and patients dying over time. Curves begin to separate around eight months before the departure implying that exiting PCPs see fewer patients leading up to the departure. As a result, I estimate event studies relative to $t = -24$ and regressions relative to $-24 \leq t < -12$ to allow for anticipation up to -12 months before the departure. Figure 1a shows that visits decrease from 0.24 visits at $t = -1$, to 0.17 visits at $t = 0$, to 0 at $t = 1$ in response to a PCP's exit. Visits are not zero in $t = 0$ because PCPs stop seeing patients at various times during the month.

Figure 1b graphs the number of visits a patient makes to the main clinic over time. The graph is similar to Figure 1a except slightly closer in terms of levels. In response to a PCP's departure, patients' decrease their rate of visiting the main clinic 47%, or from 0.32 visits in $t = -1$ to 0.15 visits in $t = 1$.

[23] Treatment and control PCPs are matched in $t = -36$ and patients are assigned to the PCP (and clinic) that provided the majority of their primary care from $-36 \leq t < -24$. The first month in the post-departure period is $t = 0$

4.1 How the Loss of a PCP Affects Patient Outcomes

The raw data in Figure 2 shows how patients' use of primary care is impacted by the loss of a PCP. The x-axis contains the length of time (in quarters) since a PCP's exit and begins two years pre-exit, or -8 quarters, and runs four years post-exit, or 16 quarters. Red crosses represent treated patients and blue triangles represent control patients. Figure 2a shows the number of primary care visits per quarter. Figure 2b shows the probability a patient forms a new relationship as a cumulative hazard rate. Figure 2c graphs the probability a patient forms a new relationship.

Figure 3 plots coefficients $\beta_t^{Treated}$ from equation 1 at the quarter level in a sub-sample that follows patients four years post-departure. Coefficients are only identified up to a constant term, so $t = quarter = -8$ is normalized to zero. Primary care visits (black line, with triangle points) and specialty visits (blue line, with circular points) are dependent variables in Figure 3a. The number of chronic medications prescribed by PCPs (black line, with triangle points) and specialists (blue line, with circular points) are dependent variables in Figure 3b. Figure 3c plots the number of ED visits and Figure 3d plots the number of ED visits for primary care treatable conditions.

The raw data in Figure 2a and the event plots in Figure 3a show a sharp, discontinuous, and long-term decrease of -0.72 primary care visits per year when a PCP exits (14.4% decrease). Partially offsetting this decrease, patients use of specialists increases 0.51 visits per year, or by 5.5% (Figure 3a). This is an immediate and sustained increase in patients' use of specialists. Adverse events—ED and inpatient visits—are also affected by a PCP's exit. ED visits significantly increase by 0.028 visits per year (3.9%) and inpatient admissions increase by 0.0057 visits per year (1.5%), an increase significant at the 10% level (Table 2 and Figure 3). These increases are isolated to the first year post-departure (Table A16). Figure 3 shows that patients increase their use of the ED for primary care treatable conditions by 0.019, or by about 68% of the increase in total ED visits.

To understand why patients are shifting away from the primary care setting towards specialists and the ED, I quantify who patients see and what kind of care patients receive post-exit. Patients rarely start new PCP relationships and instead shift to PCPs and specialists patients know. Of the PCP visits made by patients one year after a PCP's exit, 90% are to

PCPs that patients had a pre-existing relationship with.[24] Patients who lose a PCP are only 10 pp more likely to form a new relationship than patients who do not lose a PCP over the four years post-departure (Figure 2b and Figure 2c).[25,26]

Similarly, patients increase their use of specialists they know. After a PCP's exit, 83% of specialist visits are to specialists that patients have an existing relationship with (Table A15).[27] I also find that patients substitute to specialists who act closest to PCPs—e.g. nephrologists, cardiologists, and gastroenterologists—opposed to specialties that deliver short-term, condition specific care, such as surgeons (Table A18).

Patients substitution to specialists affects where patients receive preventive care, care that is typically done by PCPs (Figure 3b and Table A19). Patients receive significantly *fewer* flu vaccines, annual exams, preventive screens, total prescriptions, and chronic medication prescriptions from primary care settings after a patient's PCP exits, whereas patients receive significantly *more* from specialty settings (Table A19).[28] On aggregate, this substitution translates into patients receiving 6.8% fewer flu vaccines, 24.1% fewer annual exams, and 1.5% fewer preventive screens the first year post-departure (Table 2). Although Table 2 shows that all prescriptions as well as chronic prescriptions minimally change on aggregate, patients' prescription regimens change in potentially beneficial ways. Prescription process measures show that there is an increase in new medication prescriptions as well as an increase in patients switching prescriptions within the same medication class post-departure (Table A18). Further, the number of opioid and benzodiazepine prescription fills significantly decrease by 1.6% and 12.1%.

Patients substitution away from visiting PCPs causes patients' out of pocket spending to increase by about 2.8% and total spending to increase about 2.2% (Table 2).[29] In a 100% sample of Medicare patients, where the average PCP sees 145 unique patients per year,

[24] Table A15 shows estimates for E&M visits. 90% = (3.1 existing E&M - 0.64 point estimate) / (3.2 all E&M -0.48 point estimate).

[25] See Table A16 for results that follow patients four years post-departure.

[26] Main effects are maintained when practice size is added as an additional matching covariate (Table A17).

[27] Table A15 shows estimates for E&M visits. 83% = (2.6 existing E&M + 0.16 point estimate) / (3.1 all E&M + 0.22 point estimate).

[28] The number of preventive screens and flu vaccines administered in retail settings also significantly increase post-departure (Table A18).

[29] This increase is driven by increased ED and inpatient use: Table A15 shows that ED and inpatient charges increase by 3.2%.

patients' costs increase $3,761 and total costs increase $37,538 per exiting PCP. Medicare's cost is $33,776 ($37,538 - $3,761). This should be considered a lower bound for the costs associated with a PCP's exit because it only includes Medicare patients.

In total, relationships determine where patients' demand care and seem to be moderately important for patients' health. After a PCP leaves, patients shift to specialists they know for primary care long-term, leading to a less efficient provision of primary care. In addition to patients receiving less preventive care, patients also have an increased probability of visiting the ED and experiencing an inpatient admission. In turn, patients' substitution across settings increases both public and private costs.

4.2 Robustness Checks

In addition to analyzing pre-trends, I test for differential attrition into Medicare Advantage (MA) to address two concerns. First, if a PCP stops taking Traditional Medicare (TM) patients, I would categorize the PCP as exiting. In response, patients may switch to MA in order to continue seeing their PCP. Second, patients may switch to MA to access additional services or providers in response to the loss of a PCP. In both of these cases patients would no longer be visible to me after the switch. Somewhat alleviating these concerns, Table A15 shows that patients do not systematically switch into MA in response to a PCP's exit. I therefore drop patients that switch to MA from the main sample to reduce noise.

It could also be the case that effects attributed to a PCP's departure may instead be due to clinic-level changes. To test for this, Figure A2 plots the number of PCPs exiting over time. It shows that PCP exits occurring after the main PCP departs do not systematically happen at the treatment threshold, but rather the line trends smoothly downward two years post-departure. Therefore, there do not appear to be systematic changes occurring at the clinic that are driving effects.

5 How Much and Why is the Relationship Valued?

5.1 The Relationship Grows Over Time

Section 4.1 finds that the loss of a PCP affects patients, yet it is unclear why this is the case. I find that the loss of the relationship drives impacts because patients benefit more from seeing known PCPs. For instance, relationships may be valuable because of the experience, friendship, and trust specific to that particular PCP-patient relationship (Polanyi, 1966; Jovanovic, 1979*a*).

If relationships become more beneficial over time, treatment effects should be larger among patients with longer PCP-patient relationships (Jovanovic, 1979*a*). I therefore quantify how treatment effects vary by the length of the relationship, or quartiles of relationship length: 2-5 years, 6-8 years, 9-11 years, and 12-14 year long relationships.[30] To give a sense of whether this strategy creates balanced groups, Table A4 compares patients with 2-5 year long relationships, the bottom quartile of relationship length, to patients with longer relationships, or 6-14 year long relationships. The Table suggests that patients with longer relationships are in slightly better health than patients with shorter relationships. For instance, patients with longer relationships have slightly more primary care visits and see one more specialist on average per year.

Figure 4 plots estimated coefficients $\beta_t^{Treated}$ the first year post-departure by the length of patients' relationship with the exiting PCP. Estimates are derived from an equation similar to equation 1, but regressions are at the individual patient level and t is estimated at the year level. Coefficients are only identified up to a constant term, so the value for $t = year = -2$ is normalized to zero. All analyses compare patients with the same exiting PCP to control for PCP as well as clinic-level factors that may be different between groups. The first panel shows primary (black triangles) and specialty (blue circles) visits separately (Figure 4a). The second panel plots adverse events, which include ED and inpatient visits (Figure 4b).

Figure 4a shows that patients likelihood of substituting away from primary care to specialty care increases across the length of the exiting PCP-patient relationship. This suggests that patients with longer relationships receive less benefit from replacement PCPs, compared to

[30] See Section 2.2 for more details on how this sample was defined.

patients with shorter relationships. Of note, patients with 2-5 year long relationships do not increase their use of specialists significantly relative to the baseline rate. This suggests that patients with short relationships may view exiting and replacement PCPs as closer substitutes. However, even within the 2-5 year relationship group, primary care visits decrease from the baseline rate, suggesting that losing a short relationship is still a significant impact on patients. Figure 4b shows the rate of adverse events by the length of patients' relationship with exiting PCPs. Although imprecise given sample size constraints, the point estimates increase fairly monotonically across relationship bins. As a result, longer relationships likely contain more health-specific information.

5.2 Heterogeneity by Clinic Environment

I explore if clinics' management practices limit patients' reliance on a singular PCP, increasing the probability patients' have a back-up PCP relationship. I compare treatment effects among patients who belong to clinics that close in response to a PCP's exit, patients who belong to open clinics where PCPs care for patients one-on-one, and patients belonging to open clinics where a team of PCPs cares for patients. Patients are least able to rely on a PCP they know when a clinic closes in response to a PCP's exit and most able to substitute to PCPs they know in clinics managed as teams. In response to a PCP's departure, patients are therefore monotonically more likely to have a back-up PCP relationship at the main clinic across options.

To give a sense of observable differences across groups, Table A5 compares open and closed clinics and Table A6 compares team and individual open clinics. Table A5 shows that patients in clinics that closed versus stayed open are observably quite similar, except for clinic size. Clinics that close when a PCP departs have on average 1.5 PCPs at baseline, whereas those that stay open have on average 12.6 PCPs. Table A6 shows that individual and team clinics have several observable differences. PCPs working in team clinics are more likely to be female. Team clinics are almost twice as likely to have an NP or PA on staff and have almost 2 times more PCPs on average than individual clinics (11.8 v. 6.8). Patients in individual clinics also have more primary care visits 3-2 years before a PCP's exit compared to patients in team clinics.[31,32]

Figure 5 shows how patients across clinic environments are impacted by a PCP's exit ($\beta_t^{Treated}$). The Figure includes clinics that close (green), stay open and practice individually (blue), and stay open and practice as a team (red). Estimates are based on an equation similar to equation 1, where t is estimated at the year level. Coefficients are only identified up to a constant term, so the value for $t = year = -2$ is normalized to zero. Figure 5a overlays primary care and specialty visits. Figure 5b breaks aggregate primary care visits into primary care visits at the main clinic and visits at other PCP clinics. Figure 5c quantifies adverse events, or patients use of the ED and inpatient setting. Figure 5d includes log total spending.

Figure 5 shows that, when patients are more likely to have a back-up PCP relationship, patients are more likely to continue seeking primary care from the main clinic opposed to specialists and other primary care clinics, less likely to have an adverse event, and cost less after a PCP's exit. Figure 5a quantifies how specialty and primary care visits change by clinic environment and Figure 5b focuses on the aggregate primary care visit decline in open individual and team clinics. Figure 5a shows that patients decrease their use of primary care by -1.09 visits per year when clinics close, -0.55 visits per year in open individual clinics, and -0.53 visits per year in open team clinics (Figure 5a). Patients increase their use of specialists by 0.77 visits when the clinic closes, 0.54 visits in open individual clinics, and 0.23 visits in open team clinics (all three estimates are significantly different from each other). Figure 5b shows that patients in individual clinics are more likely to leave the main clinic and visit an alternative primary care clinic than patients in team clinics. Visits to the main clinic decrease by 1.5 visits for individual clinic patients, and 1.2 visits for team clinic patients. Visits to other primary care clinics increase by 0.88 visits among individual clinic patients and 0.63 visits for team clinic patients. Figure 5c quantifies adverse events, showing a similar pattern. Adverse events increase by 0.052 visits per year when the clinic also closes, 0.024 visits per year in open individual clinics, and 0.017 visits per year in open team clinics. Figure 5d shows that spending increases by about 43% among patients who also lose a clinic and 37% for

[31] Table A22 shows results when matching on whether the clinic was on an individual and team model, showing extremely similar results.

[32] Main results use an individual and team clinic definition that uses an above and below average threshold. (See Section 2.2 for more details on how the groups were defined.) As a robustness check, Table A23 uses the 25th, 50th, and 75th percentile as cut-offs and shows that results are qualitatively the same.

individual clinic patients as well as insignificantly decreases 10% for team clinic patients.[33] Further supporting the ability of team clinics to minimize the disruption of a PCP's exit, Table A20 shows that diagnostics and imaging do not significantly change in team clinics, but increase by 1.3% and 1.6% in individual and closing clinics. Taken together, results suggest that team-care may be an effective strategy for clinics seeking to reduce patients' reliance on a singular PCP and reduce inefficiencies associated with a discontinuity in care, especially around the time of transition.

5.3 Patients' Valuation of the Relationship

I use a travel cost model to quantify patients' revealed preference for relationships. I quantify patients' willingness-to-follow a PCP using a separate set of moves where patients would have to travel at most an additional 100 miles to follow the PCP. In these cases patients can choose to follow a PCP or continue to seek care with a replacement PCP at the original clinic.[34] Patients movement with PCPs is most likely a lower bound on patients' valuation of the relationship.

Figure 6a shows the percent of patients that follow a PCP by the change in the PCP's distance from the original clinic, relative to the distance the patient traveled to the original clinic. The Figure shows that the percent of patients that follow the PCP is linear in the distance a PCP moves. Among PCPs who move closer 100 miles closer to the patient, 70% of patients move with the PCP. When considering moves where patients have to drive farther, the Figure shows that a significant percent of patients are willing-to-drive fairly large distances to maintain the relationship. For instance, 53% of patients choose to follow a PCP that moves 50 miles from the PCP's original clinic, relative to the patient's zip code of residence.

Figure 6b complements the aggregate results by comparing patients' likelihood of following PCPs by quartiles of relationship length: 2-5 years, 6-8 years, 9-11 years, and 14-17 years. The Figure shows that patients in the longest relationship quartile are 10 percentage points

[33] Table A21 shows results after also matching on practice size. Table A22 shows results after matching on whether the clinic practiced on a panel or individual model.

[34] Willingness-to-drive analyses exclude cases where the original clinic also closed to focus on patients valuation of their main PCP versus an alternative PCP at the main clinic.

(pp) more likely than patients with the shortest quantile of relationship to drive an additional 50 miles one-way to follow a longstanding PCP.

I then quantify patients likelihood of following their PCP by whether the original clinic was managed on a team or individual model. Figure 6c compares the percent of patients following their PCP separately for PCPs leaving a clinic practicing as a team (blue) or individually (red). The Figure shows that patients in clinics that practice on an individual model are 14 pp more likely to follow their PCP when the PCP moves 50 miles away.

To assess the robustness of these findings, I explore whether or not these results are driven by rural areas having larger zip code areas, which would make centroid to centroid driving distances look larger. Figure A3 compares the percent of patients following PCPs by the local density of PCPs of the home clinic. It shows that patients in high density areas are actually 7 pp more likely to follow their PCP 50 miles. As a result, measurement error along this margin does not seem to be a main issue.

In sum, results suggest that patients value longstanding PCP-patient relationships and are willing to travel quite far to maintain the relationship. The number of patients moving with PCPs is especially large considering that 39 states enforce non-compete agreements, which legally prohibit PCPs from taking their patients with them when moving practices (Hausman and Lavetti, 2016).

6 Alternative Explanations

6.1 Are Patients Unable to Find a PCP that is a Good Match?

It is possible that effects are driven by patients being unable to find a similarly good PCP match (Jovanovic, 1979*b*). To test this hypothesis, I focus on patients with more specific needs who should be (a) less likely to re-match to a PCP and (b) more likely to substitute from primary to specialty care if it is harder for them to find a good match. I quantify patients likelihood of decreasing their use of primary care and increasing their use of specialists by whether or not they are high risk, disabled, a minority, a female patient with an exiting female PCP, above and below average relationship length, and dual eligibles (DE).

Tables A7-A12 give a sense of how these groups observably differ. High risk patients are two years older, use the medical system at a higher rate, and have larger provider networks than low risk patients (Table A7). Disabled patients have higher risk scores and use the medical system at a higher rate than not disabled patients (Table A8). Minority patients are twice as likely to be a dual eligible (DE) and in end stage renal disease than their white counterparts (Table A9). Male and female patients look fairly similar, except that female patients seeing female PCPs are two years older and see slightly more PCPs than male patients on average (Table A10). DEs appear to be in slightly worse health than non-DEs: they are almost two times as likely to be in end stage renal disease and use the health care system at a greater rate (Table A11). PCPs who have longer relationships with their patients are six years older than PCPs with shorter relationships (Table A12). On account of these level differences, All analyses contain PCP fixed effects to account for PCP differences across groups.

Figure 7 plots estimated coefficients $\beta_t^{Treated}$. Coefficients are plotted as percents to facilitate comparing across groups. Regressions follow equation 1 except t is estimated at the year level. Coefficients are only identified up to a constant term, so the value for $t = year = -2$ is normalized to zero. Figure 7a compares high risk to low risk patients, Figure 7b compares disabled to not disabled patients, Figure 7c compares minority to white patients, Figure 7d compares male to female patients with exiting female PCPs, Figure 7f compares patients with below average to above average relationship lengths, and 7e compares DE to not DE patients. All analyses control for PCP as well as clinic-level factors that may be different between groups by comparing patients with the same exiting PCP.

Figure 7 shows that most patient groups decrease their use of primary care at a similar rate for at least four years after a PCP's exit, with no sign of recovering. There are two exceptions. First, Figure 7e shows that DE are significantly more likely to decrease their use of primary care in the first year post-departure. However, DEs use of primary care converges to non-DEs over years, suggesting that this isn't necessarily a match quality mechanism. Second, Figure 7f shows that patients with shorter relationships recover their pre-departure rate of specialty care at a quicker rate than patients with longer relationships. In sum, results suggest that match quality along these dimensions is likely not a main mechanism.

6.2 Are Patients Unable to Find a Replacement PCP?

The impact of a PCP's exit on patients may be explained by patients inability to find a replacement PCP. If this is the case, patients in thinner markets should be less able to find a new PCP than patients in thicker markets. To test for this, I compare the probability a patient forms a new PCP relationship and the number of primary care visits by the local density of PCPs.

The local density of PCPs is defined as the number of PCPs filing billing claims within a 30 mile radius of each focal clinic ZIP divided by the local population. Thick markets are defined to be above average and thin markets are below average density areas. I also focus on clinics that remained open after a PCP's departure because clinics may be more likely to close in rural areas. Table A13 shows that high and low density areas are similar at baseline. Figure 8 plots estimated coefficients $\beta_t^{Treated}$ from equation 1, where t is estimated at the month level and $t = month = -24$ is normalized to zero. Figure 8a shows new patient visits Figure 8b shows total primary care visits.

Figure 8 shows that patients in thicker markets are *less* likely to establish a new PCP relationship (2.8% vs. 3.0% of visits) and decrease primary care visits by more (11.0% vs. 9.6%) than patients in thinner markets, although differences are not significantly significant. These results provide evidence against the local availability of PCPs affecting patients' rate of using primary care.[35,36]

6.3 Are Patients Unable to Access Care at Focal Clinics?

Patients may substitute to non-primary care settings because they are unable to access care at main clinics. I test this in two ways. First, I quantify the number of patients seen by staying PCPs after a PCP's exit. I then show how these changes affect outcomes among

[35] Table A24 shows additional estimates.

[36] I varied this analysis in two ways. First, I compare patients who were and were not affiliated with a clinic that has multiple sites in Table A25. When comparing patients who lost a clinic using this heterogeneity, it was not an important indicator of patients ability to re-match. However, when comparing patients in open clinics by this metric, effects were more mixed. Second, I used the Center for Medicare and Medicaid Services rural/urban fee schedule to compare rural and urban areas. This is a coarser metric than the market thickness definition constructed in the data, which is based on local availability within 30 miles. However, Table A26 shows that the results are qualitatively similar.

staying PCPs' patients. If one assumes that staying PCPs treat their existing set of patients the same as the patients they inherit from exiting PCPs, this should indicate if directly affected patients are impacted vis-à-vis staying PCPs. Second, I compare treatment effects by the size of patients' home clinic. If clinics are constrained in their ability to care for patients, patients in smaller clinics should be more affected than patients in larger clinics.

Firm Disruption and Network Effects. I estimate spillovers by moving to the clinic-level and matching clinics instead of PCPs (see Appendix B for details on the sample). I then quantify how the loss of the main PCP affects staying PCPs and staying PCPs' patients at the main clinic. For instance, it may be the case that overburdened clinics are no longer able to maintain the same quality of care, causing patients to substitute away from their main primary care clinic.

Figure 9a shows the number of patients seen per month per PCP, grouped by the type of PCP. The red crosses represent exiting PCPs, the blue triangles represent staying PCPs, and the black circles represent new PCPs. Exiting PCPs are defined to exit in $t = 0$. Staying PCPs are defined to be PCPs who were practicing at the clinic in $t \leq -36$, or three years before the main PCP's exit. New PCPs are any PCP that began practicing at the clinic from $-36 < t \leq 24$. Zeros are not included in the average, so to aid in the interpretation of Figure 9a, the total number of PCPs in each clinic is shown in Figure 9b (the denominator of the average).[37]

Figure 9a shows that staying PCPs are affected by a co-working PCPs departure. The first year post-departure, the average staying PCPs sees 44.1 more patients per year, which is sustained in year two (Table A27). The sustained increase may be because clinics do not immediately replace leaving PCPs. Figure 9b shows that the rate of new PCPs being added to the clinic trends smoothly over time, opposed to suddenly increasing when a PCP exits.

I next quantify how the increased workload affects staying PCPs' patients. By assuming that staying PCPs treat their existing set of patients (indirectly affected patients) similarly to the patients they take-on post-departure (directly affected patients), this can tell us something about how directly affected patients are treated by staying PCPs.[38] The evidence instead

[37] The average clinic size is larger than that in the matched PCP sample because solo clinics are excluded from the clinic-level sample because spillovers onto indirectly affected patients do not apply.

[38] "Indirectly affected" patients are patients of staying PCPs and do not ever have a claim billed by exiting PCPs.

shows that outcomes among indirectly affected patients remain unchanged post-departure, suggesting that staying PCPs are able to compensate for the loss of a co-worker and maintain the same standard of care (Table A27).

Effects by Size of Focal Clinic. The results above imply that co-working PCPs are affected by the loss of a co-worker, but it does not affect the standard of care. However, the aggregate effects may obscure significant heterogeneity by clinic size. For instance, smaller clinics have fewer co-working PCPs to take on the increased workload, so effects could be larger among small clinic PCPs. I test this hypothesis by comparing small (1-3 PCPs) to large (4-100 PCPs) clinics that stay open after a PCP's exit.

Table 3 shows that treatment effects are larger among small clinic patients. However, size is highly correlated with whether the clinic practices on an individual or team model (Table A14). Table A28 shows that differences in management structure drive differences, rather than size.

This suggests that differences across practice sizes are driven by management structure, rather than size. a 2x2 matrix with treatment effects by size and management structure. The Table shows that patients' visits to main clinics decreases by 1.4 visits in shared models with 1-3 PCPs and 1.4 visits in shared models with 4-100 PCPs. For individual clinics, the number of visits to the main clinic decreases by 2.0 visits in clinics with 1-3 PCPs and 1.7 visits in clinics with 4-100 PCPs. When comparing patients' visits to other clinics, among shared model patients, there is a 0.93 visit increase among patients in 1-3 PCP clinics and a 0.82 visit increase among patients in 4-100 PCP clinics.

6.4 Ruling Out Differences in Leaving and Replacement PCP Practice Patterns

There is a growing literature finding that PCP practice styles explain about 2-3% of the variation in patients' long-run total utilization (Kwok, 2019; Fadlon and Parys, 2020). As a result, differences between exiting and replacement PCPs propensity to refer to specialists may explain the sustained decrease in primary care visits and increase in specialty visits.

I test for the importance of this hypothesis by controlling for specialist and primary care utilization of replacement PCPs' indirectly affected patients from $1 \leq t \leq 12$ (i.e. the leave-out-mean).[39] In order to attribute utilization to a specific PCP, I assign all patients to the modal PCP seen from $1 \leq t \leq 12$.[40] Treated patients who do not see a new PCP from $1 \leq t \leq 12$ (31% of patients) and treated patients with replacement PCPs who only see treated patients over the relevant period (2% of patients) are not included in analyses. This is a limitation of this method and of the literature more generally.

The magnitude of the coefficients does not significantly change when controlling for the leave-out-mean of specialist and primary care utilization (Table 4). The number of primary care visits decline by 0.69 visits (SE 0.021), which is not significantly different from the decline of 0.71 visits (SE 0.022) in the uncontrolled results. The number of specialist visits is also not significantly different when controlling for indirectly affected patients use of specialists (0.52 vs 0.51 visits). These results rule out changing practice styles as an explanation for the long-term decline in primary care visits and increase in specialty visits.

7 Conclusion

This paper shows that longstanding relationships between PCPs and patients lead to a more efficient provision of primary care and are moderately important for patients' health. I explain this phenomena by showing that patients receive more benefit from seeing PCPs they know because relationships build over time and plausibly contain health-specific information. I also show that patients receive the least benefit from specific PCP-patient relationships in clinics that practice as teams, where PCPs are the most interchangeable.

These findings may be magnified in the Medicare context because Medicare patients are older and in worse health. Medicare patients also face low and relatively constant out-of-pocket costs across providers and have large teams of PCPs and specialists. While patients facing similar costs across providers means that patients' substitution across providers represents preferences, it is unclear how results would generalize to younger patients who may face network constraints, need a PCP for referrals, and have less attachment to individual PCPs. For instance, requiring patients to receive a referral to a specialist may push patients back

[39] I control for 100 quantiles of SP and PCP utilization.

[40] Utilization from $1 \leq t \leq 12$ was used to follow other work, namely Kwok (2019). Using this assignment mechanism, I find the median PCP sees 76 non-focal patients over this period.

to primary care, encouraging patients to start new relationships.

Patients who are more able to substitute to pre-existing PCPs are more likely to stay engaged in primary care. In addition to teams, which this work speaks to, organizations such as independent practice associations may be a helpful bridge for patients as they attempt to re-establish care. This is especially relevant for patients who belong to clinics that close when a PCP exits, who cannot switch to PCPs within the main clinic.

Findings clearly affirm the theoretical role of the PCP as a point of contact to the rest of the health system as well as an administrator of preventive care (Starfield, 1994). This role is receiving more focus as recent and proposed policy reforms directly target the PCP-patient relationship. For instance, Medicare's Shared Savings Program shares savings with PCPs who keep total costs below a financial benchmark, encouraging PCPs to take greater control over the continuum of patient care (McWilliams et al., 2016).

Continuing to develop our understanding of PCP-patient relationships helps firms and policymakers mitigate the harms of disrupting them. PCP departures are especially ubiquitous in the health care context where volatile insurance networks and non-compete agreements may artificially sever a PCP-patient relationship, even if the PCP remains in practice. For instance, 26% of commercially insured individuals switch insurance plans in a given year and 39 states enforce non-compete agreements (Barnett et al. 2017 and Hausman and Lavetti 2016). PCP retirements are also projected to increase over the next decade, with 32% of PCPs currently over age 60 (Sabety, Jena and Barnett, 2020). As a result, interventions such as team care may be better able to maintain patients' health as a growing number of PCPs leave clinical practice.

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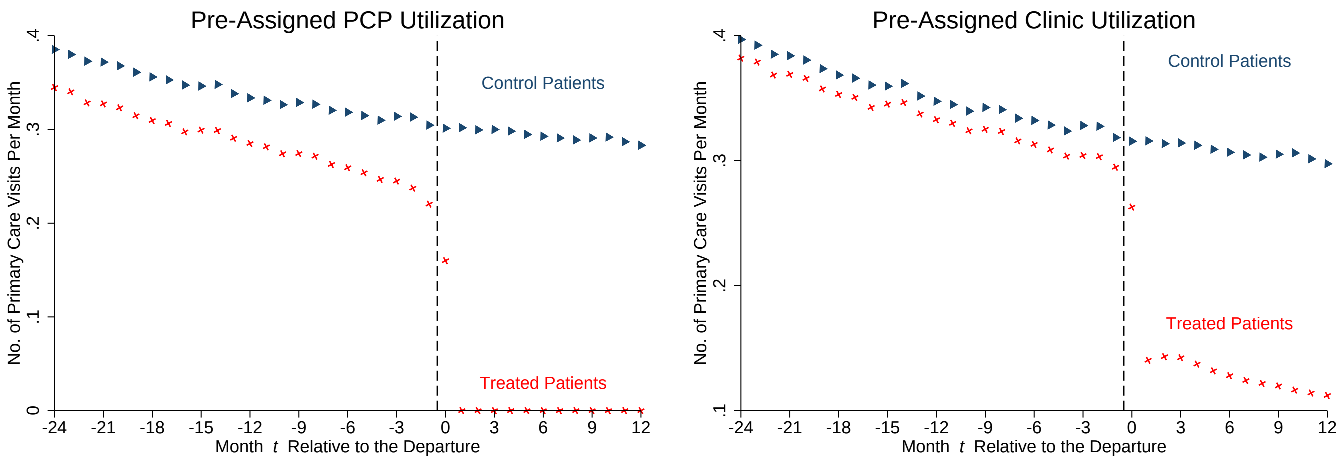
8 Figures

Figure 1: Number of Visits Patients Make to the Assigned PCP and Clinic

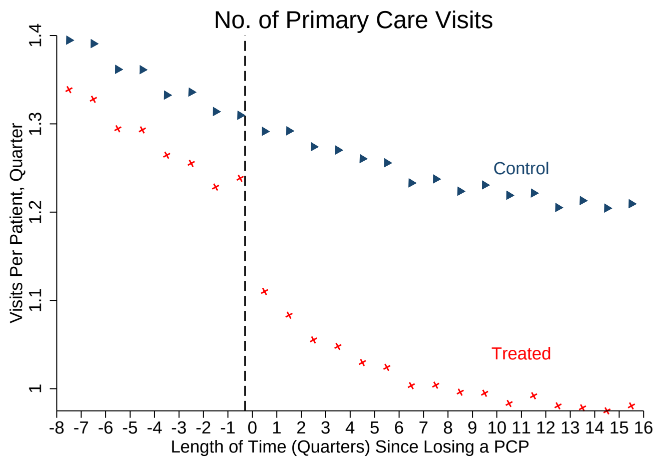


(a) Number of Primary Care Visits by Patients to Assigned PCPs

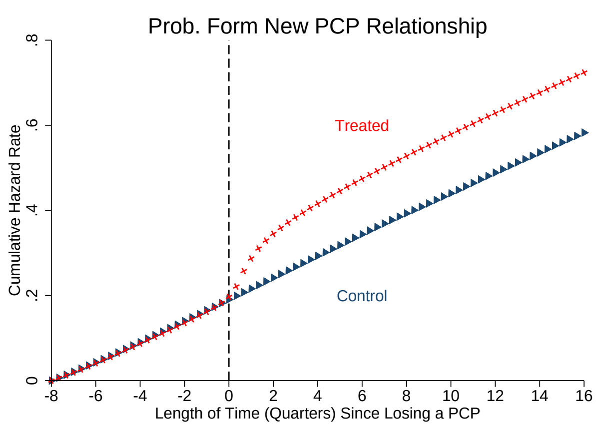
(b) Number of Primary Care Visits by Patients to Assigned Clinics

Notes: Figure 1a and Figure 1b plot patients' number of primary care visits to assigned (a) PCPs and (b) clinics over relative month t. Graphs show that the loss of a PCP is a shock to patients. The y-axis starts in relative time -24 and ends in relative time 12, or 1 year post-departure. The underlying sample matches leaving to staying PCPs in $t = -36$. Patients are assigned to PCPs and clinics from $-36 \leq t < -24$ based on where the majority of their primary care was provided. Primary care visits among patients of staying PCPs are reflected in blue triangles and patients of exiting PCPs are reflected in red crosses.

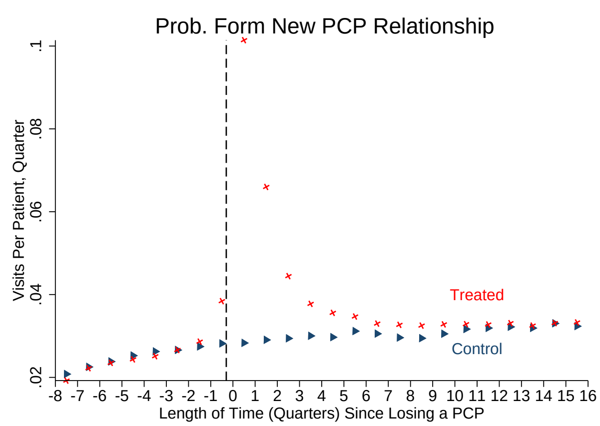
Figure 2: Effects of a PCP Leaving a Clinic on Patients' Utilization of Care



(a) Raw Avg. No. PCP Visits



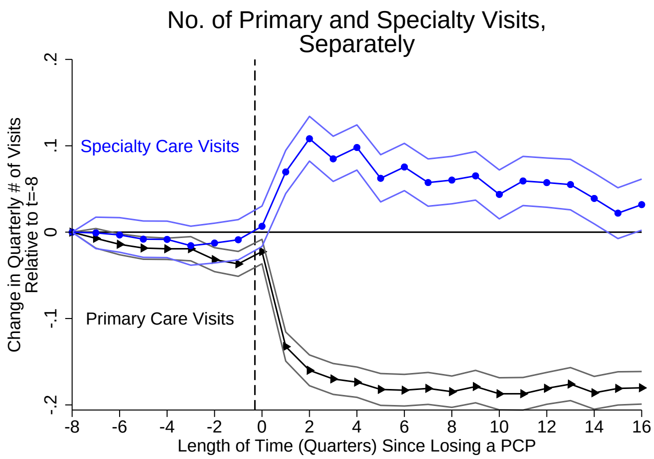
(b) Cumulative Hazard Rate of Patients Forming New Relationships



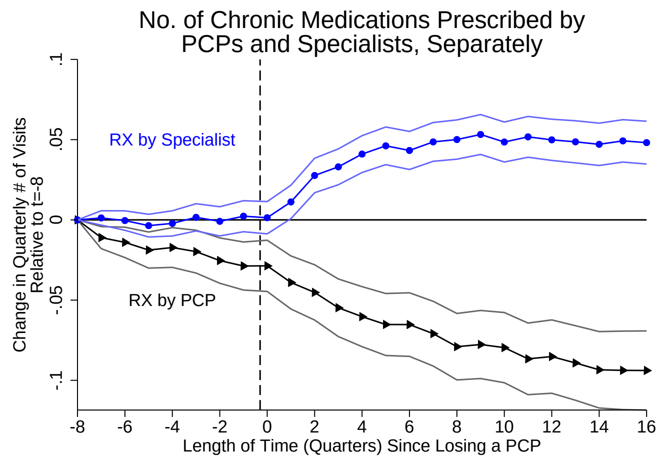
(c) Probability Patient Forms New Relationship

Notes: Figure 2 shows the effect of a PCP's departure in the raw data. The x-axis contains time relative to the departure in $q = 0$, where relative time is measured in quarters and stretches 4 years post-departure. Figure 2b shows the probability a patient forms a new relationship as a cumulative hazard rate. Figure 2c graphs the probability a patient forms a new relationship by relative time t. Treated patients are represented by red crosses, whereas control patients are represented by blue triangles.

Figure 3: Effects of a PCP Leaving a Clinic on
Patients' Utilization of Care

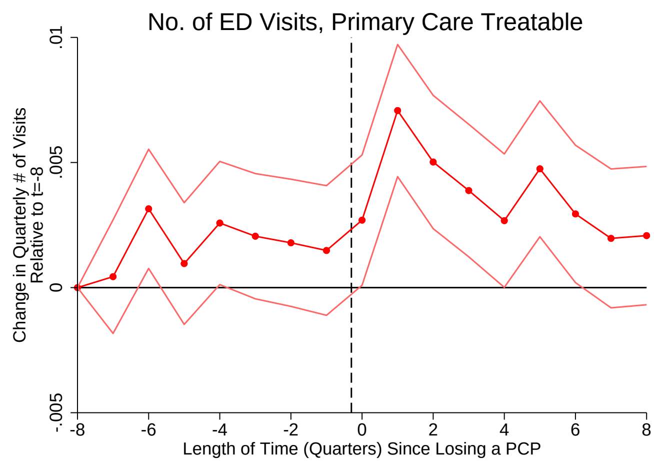


(a) Number of Visits to PCPs and Specialists



(b) Number of Chronic Medications by Type of Prescriber

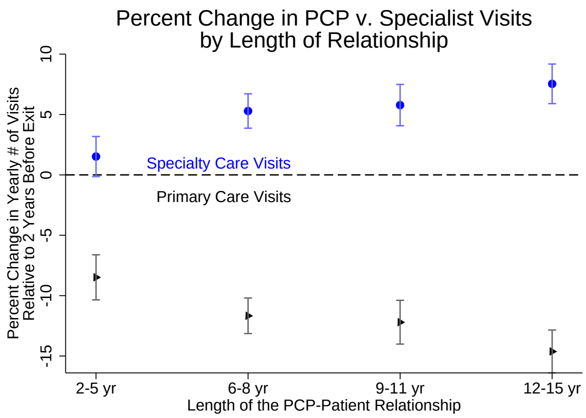
(c) Number of Emergency Department (ED) Visits



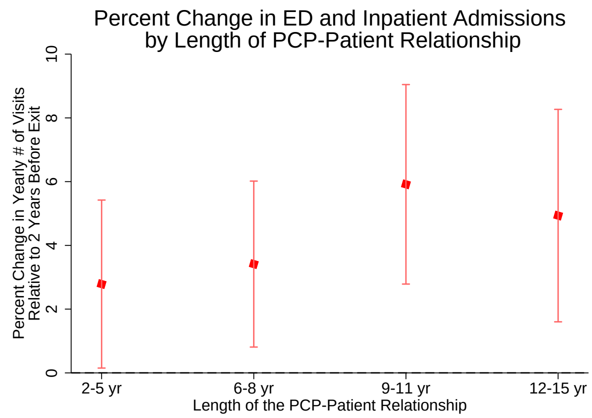
(d) Number of ED Visits for PCP Treatable Conditions

Notes: Event study graphs plot each coefficient from the difference-in-differences specification outlined in Section 3.3. Regressions are at the PCP-quarter level, contain pre-departure PCP fixed effects, and cluster at the PCP-match level. "ED" represents emergency department visits. Primary care treatable ED visits are classified using an algorithm developed by Billings, Parikh and Mijanovich (2000) and updated by Johnston et al. (2017). Pooled, yearly estimates are in Table 2 and Table A19.

Figure 4: Effects by Length of Exiting PCP-Patient Relationship



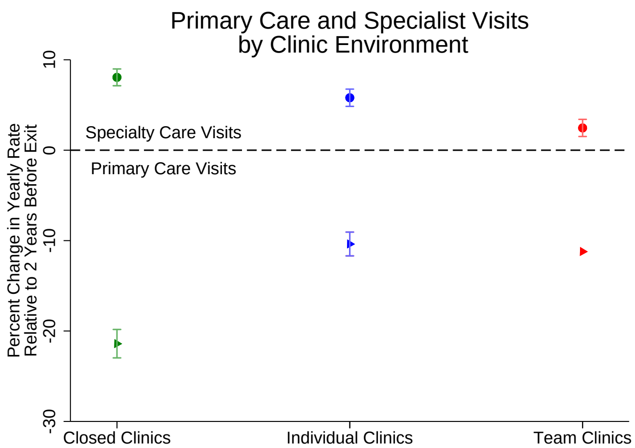
(a) Primary Care v. Specialty Visits
by Relationship Length



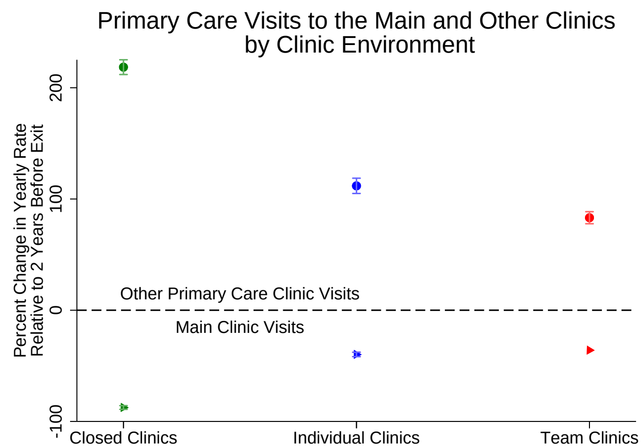
(b) Adverse Events
by Relationship Length

Notes: Event study graphs plot each pooled coefficient from the difference-in-differences specification outlined in Section 3.3 one year post-departure. Regressions are estimated at the patient-year level, contain pre-departure PCP fixed effects, and cluster at the PCP-match level. Patients aged < 75 as of $t = -36$ were dropped from analyses to avoid censoring due to only observing patients once they become Medicare eligible (typically at age 65). See Section 2.2 for more details on how heterogeneity and variables were defined.

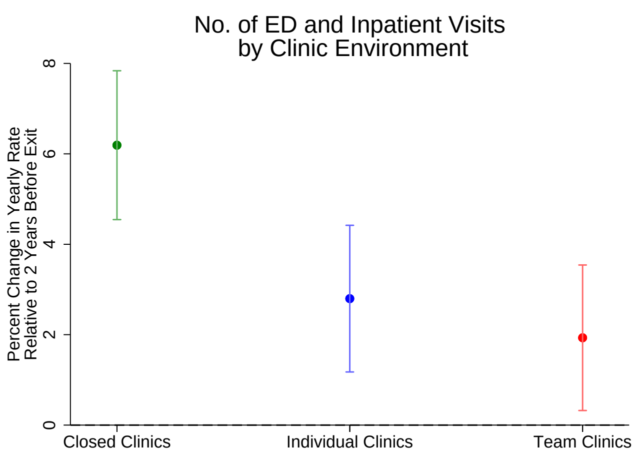
Figure 5: Effects of a PCP Leaving a Clinic on Patients' Utilization of Care



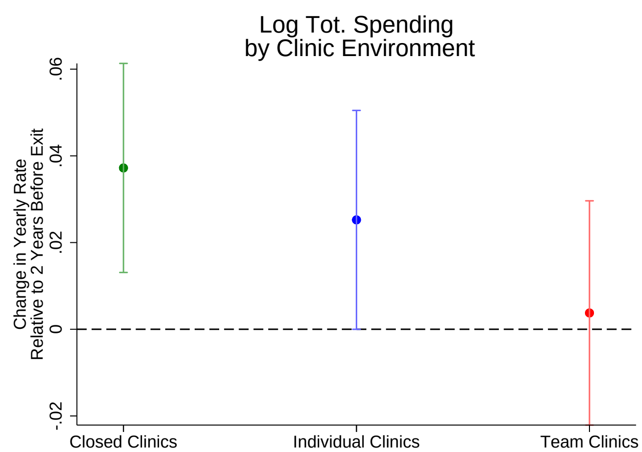
(a) Use of Primary and Specialty Care Across Clinic Environments



(b) Location of PCP Visit Across Clinic Environments



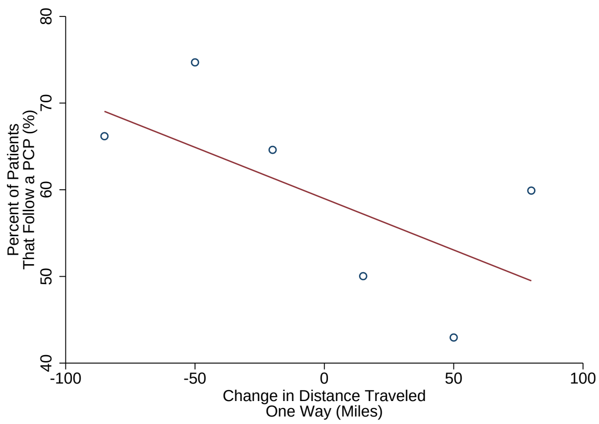
(c) Adverse Events Across Clinic Environments



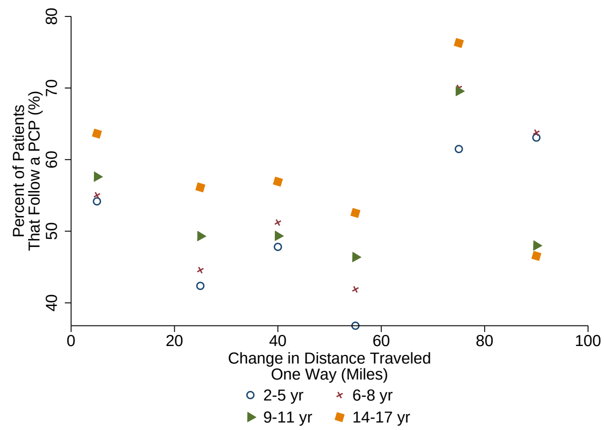
(d) Log Total Spending Across Clinic Environments

Notes: Event study graphs plot estimated coefficients $\beta_t^{Treated}$ from equation 1, where t is estimated at the year level and patients are followed one year post-departure. Regressions are at the PCP-year level, contain pre-departure PCP fixed effects, and cluster at the PCP-match level. Coefficients are only identified up to a constant term, so the value for $t = year = -2$ is normalized to zero. Figure 5a overlays primary care against specialty visits. It includes clinics that close (green line), stay open and practice individually (blue line), and stay open and practice as a team (red line). Figure 5b breaks aggregate primary care visits into primary care visits at the main clinic and visits at other PCP clinics. Table A20 shows point estimates.

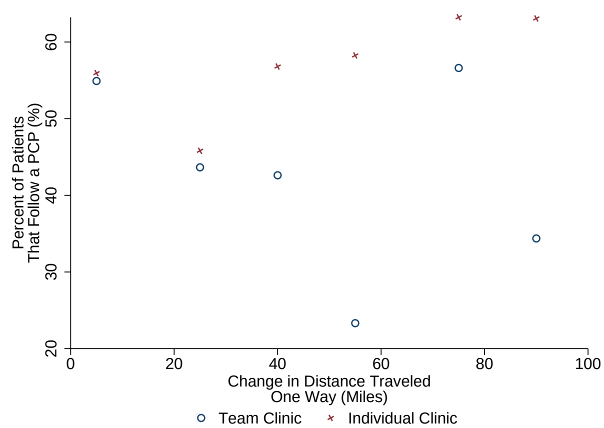
Figure 6: Patients Valuation of PCP Relationships
Using Patients' Willingness-to-Drive



(a) Percent of Patients Following
a Moving PCP



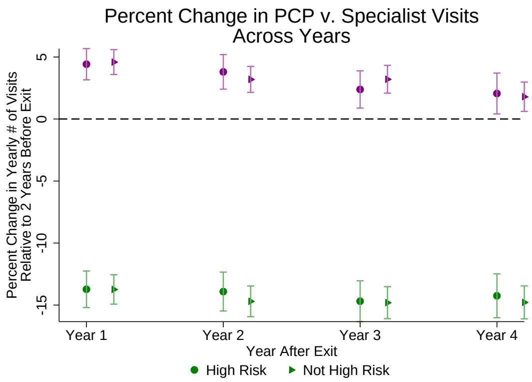
(b) Percent of Patients Following
a Moving PCP by Relationship Length



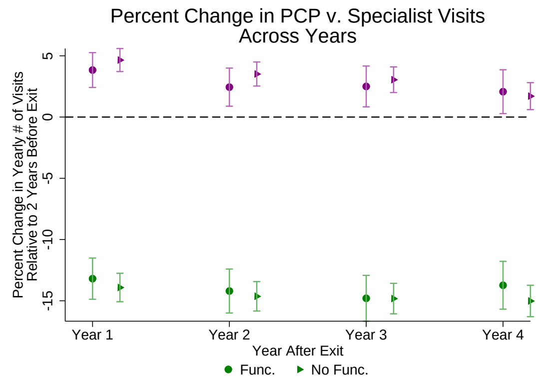
(c) Percent of Patients Following
a Moving PCP by Clinic Environment

Notes: The binscatter plots show the percent of patients that follow a PCP by the distance the PCP moves from the original clinic, relative to the patient's zip code of residence. Negative distances indicate that the PCP moved closer to the patient's zip code of residence and positive distances show that the PCP moved farther.

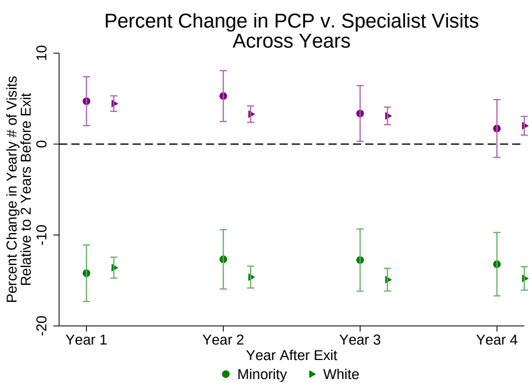
Figure 7: Effects of a PCP Leaving on PCP Visits
by Groups With More Specific Needs



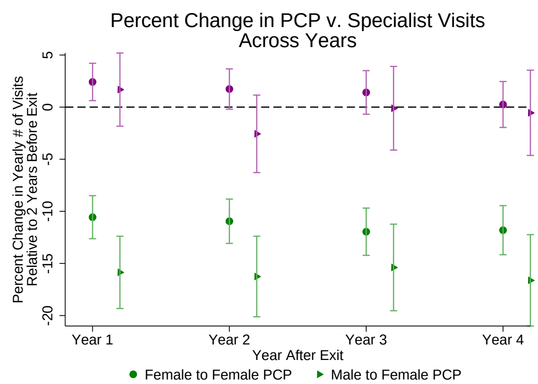
(a) Heterogeneity by Patient Risk Status



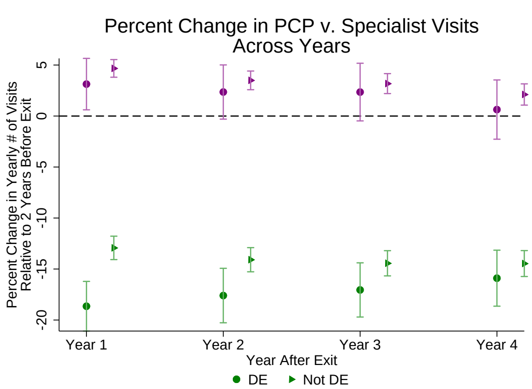
(b) Heterogeneity by Disability Status



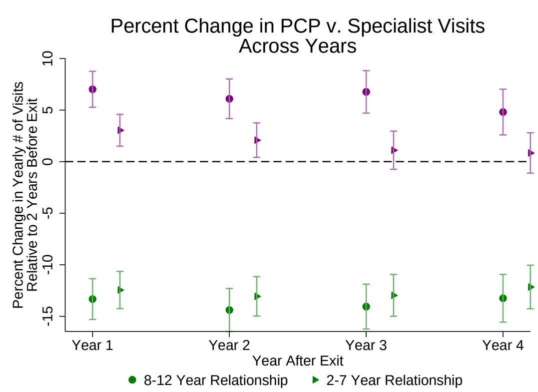
(c) Heterogeneity by Patient Race



(d) Female v. Male Patient with Female PCP



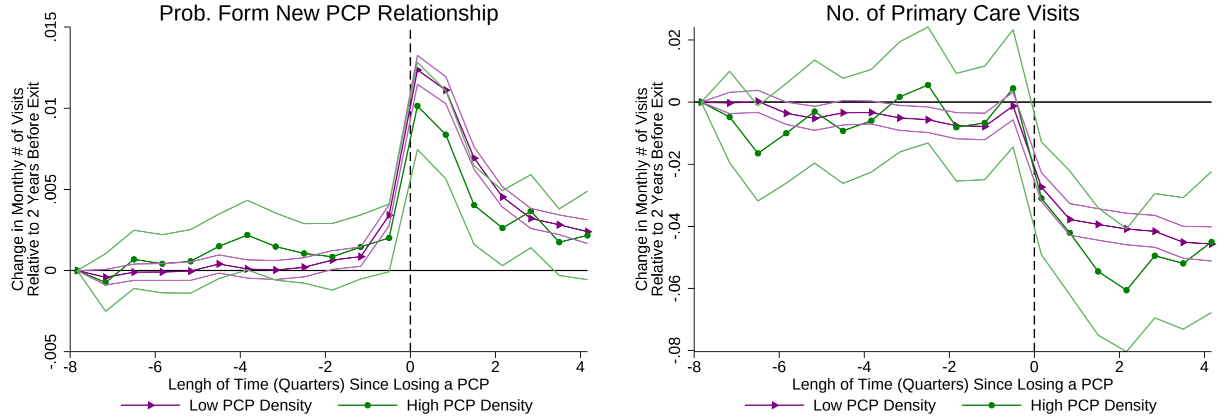
(e) Heterogeneity by Dual Eligible Status



(f) Heterogeneity by Relationship Length

Notes: Section 3.3 outlines the underlying specification, which follows patients 4 years post-departure. Regressions are at the PCP-year level, contain pre-departure PCP fixed effects, and cluster at the PCP-match level.

Figure 8: Effects of a PCP Leaving by Local Density of PCPs

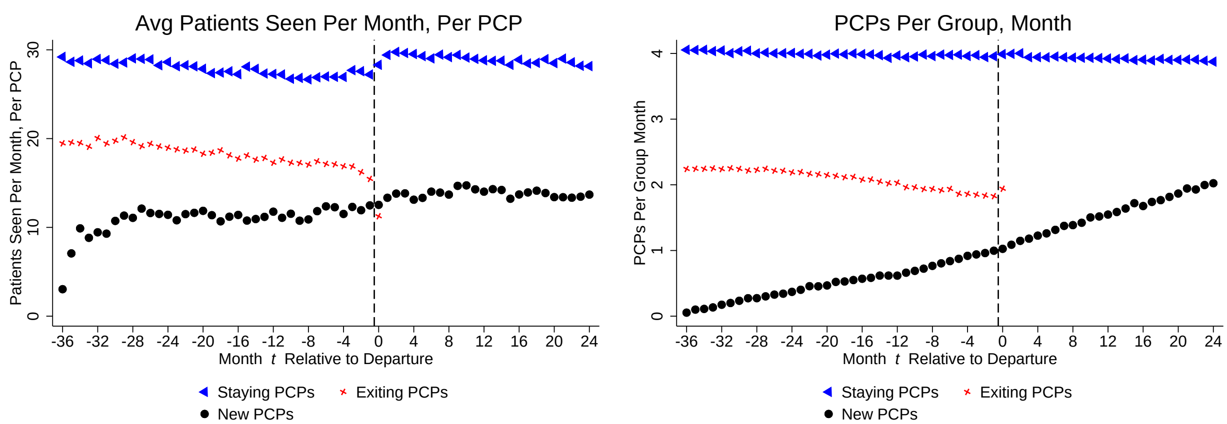


(a) Probability of New PCP Relationship

(b) Number of Primary Care Visits

Notes: Section 3.3 outlines the underlying specification, which only follows patients for one year post-departure belonging to clinics that stay open post-departure. Estimates are relative to *quarter* $= -8$. Density is defined by the number of PCPs within a 30 mile radius divided by the population in that zip code. High PCP density areas are above average density and low PCP density areas are below average density. Table A24 contains pooled point estimates.

Figure 9: Clinic-Level Effects



(a) Average Number of Patients Seen Per Month, Per PCP by Group

(b) Number of PCPs by Type of PCP Over Time

Notes: Graphs rely on a sample that matches *clinics*, instead of PCPs. This sample does not include practices with one PCP. Additional details are described in Appendix B. Figure 9a shows the number of patients seen per month, per PCP by type of PCP. Blue triangles represent staying PCPs, a group that includes PCPs that existed at the clinic in $t = -36$. Red crosses represent exiting PCP, who exit from $0 \leq t \leq 24$. Black circles represent PCPs that are new to the clinic between $-35 \leq t \leq 24$. Because points in Figure 9a do not account for the size of the group, Figure 9b shows the number of PCPs per group over time (the denominator of the rate showed in Figure 9a).

9 Tables

Table 1: Balance Table for Exiting PCPs and Their Patients

	Treatment	Control	
	Mean (sd)	Mean (sd)	Normalized Diff.
% Match	78%	40%	
No. of PCPs	16,646	16,646	
No. of Patients	454,527	511,412	
No. of Observations	45,031,261	45,031,261	
PCP Matching Covariates, 3 Years Before PCP Exit			
PCP Age (yr)	54.4(12.4)	53.5(10.2)	0.075
Caseload per PCP/Month	12.3(10.6)	12.3(10.6)	–
Patient Covariates That Were Not Matched On, 3-2 Years Before PCP Exit			
Patient Demographics			
Patient Age (yr)	71.4(6.0)	71.8(5.2)	0.076
White (%)	85.8(22.0)	81.0(25.6)	0.20
Female (%)	36.3(19.7)	36.4(17.5)	0.0067
Urban (%)	81.2(39.0)	87.2(33.4)	0.16
Patient Clinical Characteristics			
Elixhauser Risk Score	2.4(0.82)	2.6(0.83)	0.19
End Stage Renal Disease (%)	0.85(3.1)	1.0(3.1)	0.047
Also Enrolled in Medicaid (%)	19.2(22.1)	21.1(23.6)	0.084
Average Annual Rate per Patient			
No. of Primary Care Visits	5.5(2.8)	5.8(2.6)	0.091
No. of PCPs Seen	2.5(1.0)	2.0(0.65)	0.61
No. of Specialty Care Visits	9.3(4.8)	9.7(4.7)	0.082
No. of Specialists Seen	4.5(2.0)	4.8(2.0)	0.15
No. of Emergency Department Visits	0.68(0.68)	0.64(0.53)	0.062
No. of Inpatient Department Visits	0.35(0.31)	0.36(0.31)	0.038
Annual Patient Expense ($)	960.89(872.43)	1039.96(961.90)	0.086
Annual Spending ($)	9588.22(13808.21)	10807.12(14322.07)	0.087
Prob. of Death (%)	0.046(0.19)	0.048(0.17)	0.011

Notes: "Normalized Diff." stands for normalized difference. The PCP sample includes high volume PCPs, control PCPs who did not practice with exiting PCPs, and PCPs practicing in clinics with fewer than 100 PCPs. PCP age was determined from NPPES, Doximity, Medicare's MD-PPAS, and Physician Compare. In addition to the PCP level matching covariates reported, gender, PCP training (i.e. MD/DO, PA, NP), and month year of calendar time were exactly matched on. The caseload per PCP/month captured the number of patients seen by each PCP for any type of visit, regardless of whether the PCP was assigned as the patient's PCP. Patient age, gender, and race were determined according to the Medicare Beneficiary Summary File. "Urban" refers to patients' clinic locations, which were determined using the Center for Medicare and Medicaid Services rural/urban fee schedule. The Elixhauser Risk Index scores patients based on commorbities and pre-existing conditions that are predictive of death; scores range from 0 to 12, with higher scores indicating more coexisting conditions and that patients are of "higher risk." Whether a patient was also enrolled in the end stage renal disease program and/or Medicaid was determined according to the Medicare Beneficiary Summary File. Spending includes provider charges from the carrier file, inpatient charges, and outpatient charges.

Table 2: Treatment Effect of a PCP Leaving a Clinic

Type	Mean	Impact	Type	Mean	Impact
Utilization of Clinic Based Services			**Preventive Care**		
No. of Specialist and Primary Care Visits	14.3	-0.21 (0.037) -1.4%	Tot. Amount of Preventive Care	2.1	-0.069 (0.013) -3.3%
No. of Primary Care Visits	5.0	-0.72 (0.021) -14.4%	Prob. of a Flu Vaccine	0.48	-0.033 (0.0024) -6.8%
Prob. Form New PCP Relationship	0.037	0.058 (0.00092) 157.5%	No. of Annual Exams	0.057	-0.014 (0.0021) -24.1%
No. of Specialist Visits	9.3	0.51 (0.029) 5.5%	No. of Preventive Screens	1.6	-0.023 (0.012) -1.4%
Log Tot. Spending	9.4	0.022 (0.0082) —	**Aggregate Markers for Poor Care**		
			No. of Emergency Department Visits	0.72	0.028 (0.0040) 3.9%
Log Tot. Out of Pocket	6.5	0.028 (0.0081) —	No. of ED Visits, Primary Care Treatable	0.48	0.019 (0.0030) 3.9%
Medications					
No. of Filled Prescriptions	15.6	-0.16 (0.074) -1.011%	No. of Inpatient Visits	0.38	0.0057 (0.0028) 1.5%
No. of Chronic Med RX Fills	5.9	-0.014 (0.028) -0.23%	Prob. of Death	0.048	0.00049 (0.00072) 1.024%
Treated PCP Sample Size	16646				
Control PCP Sample Size	16646				

Notes: The table displays results from the difference-in-differences specification outlined in Section 3.3, which follows patients one year post-departure. “Prob.” indicates that the outcome is the yearly probability. “No.” and “Tot.” indicate that the outcome is the yearly number. Regressions are at the PCP-year level, contain pre-departure PCP fixed effects, and cluster at the PCP-match level. See Section A.1 for how medications were defined. See Section 2.2 for other variable definitions.

Table 3: Treatment Effect of a PCP Leaving a Clinic
Utilization of Clinic Based Services by Focal Clinic Practice Size

Within Open Clinics	1-3 PCPs		4-100 PCPs		
Type	Mean	Impact	Mean	Impact	P-Value
No. of Primary Care Visits	5.0	**-0.67** (0.050) -13.4%	4.9	**-0.56** (0.029) -11.4%	0.04
No. of Specialist Visits	9.5	**0.59** (0.059) 6.2%	9.1	**0.32** (0.048) 3.5%	p< 0.001
Treated PCP Sample Size	2133		9905		
Control PCP Sample Size	13652		2994		

Notes: The underlying specification matches PCPs, as outlined in Section 3.3, and follows patients belonging to open clinics one year post-departure. "No." indicates that the outcome is the yearly number. Regressions are at the PCP-year level, contain pre-departure PCP fixed effects, and cluster at the PCP-match level. Clinics with 1-3 PCPs were compared to those with 4-100 PCPs because 3 PCPs was the median practice size (7 is the mean). See Section 6.3 for more details on how small and large groups were created.

Table 4: Treatment Effect of a PCP Leaving a Clinic
Controlling for Replacement PCP Practice Patterns

	Without Controls		With Controls
Type	Mean	Impact	Impact
No. of Primary Care Visits	5.0	-0.71 (0.022) -14.2%	-0.69 (0.021) -13.9%
No. of Specialist Visits	9.3	0.51 (0.029) 5.5%	0.52 (0.029) 5.5%
Treated PCP Sample Size	16432		16432
Control PCP Sample Size	16615		16615

Notes: The underlying specification is outlined in Section 3.3 and follows patients one year post-departure. "No." indicates that the outcome is the yearly number. The leave-one-out average of utilization of replacement PCP's patients was controlled for non-parametrically using 100 quantiles of the replacement PCP's non-focal patient's PCP and specialist utilization. PCPs who only saw focal patients are not included in analyses. See Section 6.4 for additional definitions.

Appendix

Appendix A Additional Data Details

Table A1: Prioritization of Data Sources

Outcome	1^{st}	2^{nd}	3^{rd}	4^{th}	5^{th}
NP, PA, or MD/DO	NPPES	MD-PPAS	PC	Doximity	Claims
Physician Specialty	Doximity	MD-PPAS	Claims		
Age	MD-PPAS	Doximity			
Gender	Modal Response				

Notes: The National Plan and Provider Enumeration System (NPPES), Doximity, Medicare's MD-PPAS, Physician Compare (PC), and Medicare's Part B Carrier file (Claims) were combined and prioritized based on reliability to determine the type of provider, specialty, sub-specialty age and gender based on health providers' national provider identifiers (NPI). MD/DO, PA, and NP stands for medical doctors/doctors of osteopathy, physician assistants, and nurse practitioners, respectively. "Modal Response" means that the modal gender across all five data sources was considered the correct sex.

A.1 Additional Definitions

Each PCP is assigned a unique identifier combining their NPI and associated clinic identifier (NPI-TIN-ZIP). NPIs belonging to organizations, and not individuals, are dropped from the sample because it is not possible to observe individual provider exits.

Clinic Closures. I define clinic closures to occur when a PCP departs and (i) the TIN is the last TIN observed at the ZIP,[41] (ii) all PCPs at the clinic completely disappear from the data, or (iii) the TIN disappears from the data in month $t + 1$ and the number of NPIs at that nine digit zip decreases by the exact number of NPIs affiliated with that clinic as of month t.

Utilization. "Office settings" are tagged using place of service codes equal to 11 in the carrier file.Medicare Provider Analysis and Review files identify hospitalizations. I do not use years 2002-2007 to define departures because in 2008 provider identifiers switch from UPINs

[41] This would not include clinics that switched TINs due to an ownership change because I would observe a new clinic at that ZIP in that case.

to NPIs. The crosswalk between UPINs and NPIs is imperfect, so to avoid misclassifying departures I focus on later years. See Section 2.1 for how I identified whether a provider's NPI belonged to a PCP or specialist.

Total spending follows recent literature and aggregates patients' carrier, inpatient, outpatient, urgent care, and ED charges (Finkelstein, Gentzkow and Williams, 2016). Out-of-pocket costs aggregate the coinsurance and deductibles paid by patients for these services. Prescription drug claims are obtained from the Part D Event and Plan Characteristic files. Medicare Beneficiary Summary files provide patients' date of death, demographic characteristics, and enrollment information. All files are linked using beneficiary identification numbers and claim dates.

Medicare Advantage Patients. Patients were coded as being in Medicare Advantage (MA) according to the Master Beneficiary Summary file.

Medications. The number of medications as well as chronic medications are classified. Medications are counted based on filled prescriptions, so prescriptions that are written but not filled are missed. The chronic medication category includes Selective Serotonin Reuptake Inhibitors (SSRIs), antihypertensives, antidiabetics, and statins. In order to derive the classification, prescriptions are aggregated into categories and classes using a crosswalk between RedBook data and the generic names from Medicare's Part D plan characteristics file.

Statins were classified as antihyperlipidemic drugs. Opioids were classified as opiate agonists, opiate part agonists, and opiate antagonists. Antihypertensives include NEC cardiac drugs (e.g. losartan and olmesartan), ACE inhibitors, alpha-beta blockers, beta blockers, and calcium channel blockers. Antidiabetics include insulins, sulfonylureas, and other antidiabetic agents. Supplies used by diabetics, such as lancets and blood sugar diagnostic materials, were also included. Antidepressants included prescriptions like fluoxetine, escitalopram, and sertraline. Benzodiazepines included prescriptions like lorazepam, alprazolam, and diazepam. NPIs on prescription scripts were used to identify prescribers. Whether a prescriber was a PCP or specialist was determined from merging in the NPI data set described in 2.1.

Patient Risk Score and High Risk Patients. Elixhauser scores were used to create a risk index based on patients' entire set of International Classification of Disease 9th and 10th edition (ICD-9/10) diagnosis codes from the carrier file. The Elixhauser Index scores patients based on commorbities and pre-existing conditions that are predictive of death.

Patients' Elixhauser scores were derived using the Stata function "Elixhauser."[42] To define high risk patients, yearly risk scores were derived based on all diagnosis codes recorded over the year. Patients who had no claims in a specific year were given a risk score of zero. The score was used to stratify the population into low and high risk patients, within a PCP's pool of patients.[43] The top quartile of scores were defined to be high risk, the bottom $\frac{3}{4}$ were defined to be not high risk.

Clinic Rural or Urban. A clinic's zip code was determined to be urban or rural using the Center for Medicare and Medicaid Services 2019 fee schedule.

Additional Patient Sample Restrictions. Patients who switched in and out of being enrolled in Medicare Advantage (MA) were dropped from the sample to avoid missing data on the patient while they were in MA. All remaining patients who enrolled in MA from $-36 \leq t < -24$, or over the assignment period, were dropped from the main sample. They were only dropped once it was determined that patients do not differentially switch to MA at the threshold. This is checked and quantified in Table A15. Patients that died over the assignment period were also dropped from the sample. This was done to precisely define a PCP's pool of patients from $-36 \leq t < -24$.

A.2 Additional Description of Departures

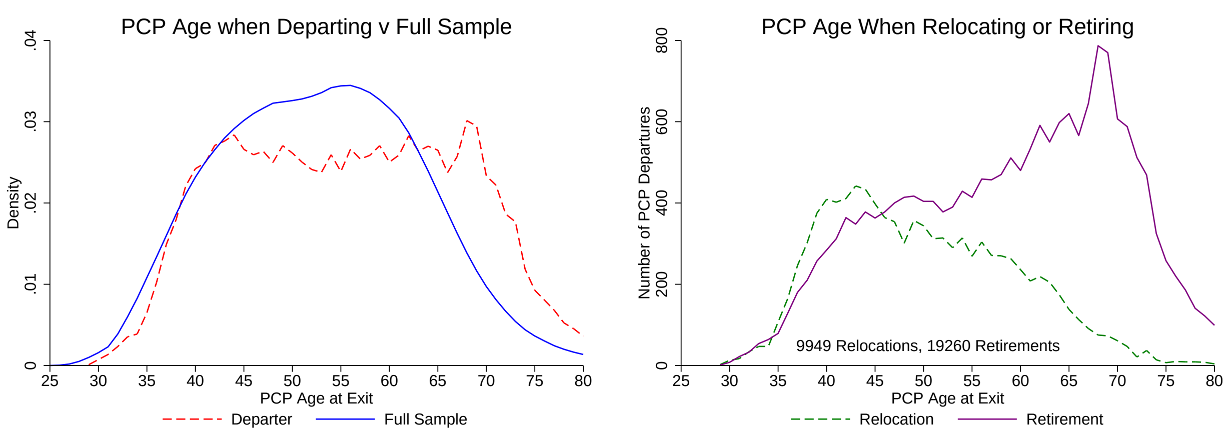
[42] Vicki Stagg, 2015. "Elixhauser: Stata module to calculate Elixhauser index of comorbidity," Statistical Software Components S458077, Boston College Department of Economics.

[43] Elixhauser, Anne, Claudia Steiner, D. Robert Harris, and Rosanna M. Coffey. "Comorbidity measures for use with administrative data." Medical care (1998): 8-27.

Table A2: Breakdown of Departures

2005	397	*.34%*
2006	798	*.61%*
2007	1,524	*1.09%*
2008	2,041	*1.38%*
2009	1,763	*1.23%*
2010	2,234	*1.54%*
2011	2,666	*1.86%*
2012	3,041	*2.14%*
2013	3,407	*2.41%*
2014	3,635	*2.58%*
2015	3,710	*2.7%*
Total Departures:	29,209	*11%*

Figure A1: Histograms of PCP Age



(a) Departing versus the Full Sample, by PCP Age

(b) PCP Age When Moving versus Full Departures

Table A3: Match Attrition for Each Matching Variable

Dropping	Treatment Match Rate
–	71%
PCP Age	74%
Female	73%
Patients Seen at t=-36	76%
NP, PA, or MD	75%

Appendix B Clinic-Level Sample

Treated Clinics: The same departure definition was used as in Section 2.2. Treatment clinics are defined to be clinics that (i) existed for 49 months, (ii) see an average of $\geq$2 patients per month over the period, and (iii) see $\geq$30 patients from $-36 \leq t \leq -24$. This algorithm drops clinic closures and solo clinics. Further, clinics with >100 PCPs were excluded.

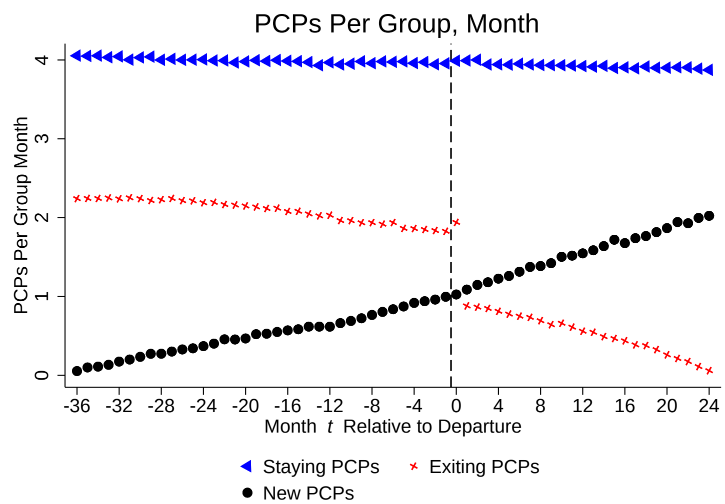
Control Clinics: If a PCP departed a clinic but the conditions laid out in Section 2.2 were not met, the PCP would be considered a control and, as such, the PCP's clinic would be called a "control clinic." Further, control clinics had to (i) exist for 49 months, (ii) see an average of $\geq$2 patients per month over the period, and (iii) see $\geq$30 patients from $-36 \leq t \leq -24$.

Matching: Three coarsened bins of average PCP age at the clinic, seven coarsened bins of the number of PCPs per practice, nine coarsened bins of the number of patients seen in $t = -36$, whether or not the clinic was on an individual or shared model, and month and year of calendar time were matched on.

Indirectly Affected Patients: I call a patient indirectly affected if they *never* saw a strongly departing PCP. I assign patients to clinics in $-36 \leq t \leq -24$ and then I assign patients to PCPs within the clinic based on their modal PCP.

Additional Sample Restrictions: Clinics where the total number of PCPs changed by more than 2 standard deviations in a given year were dropped. This additional restriction was imposed on the clinic sample because being able to accurately draw clinic barriers is more important for clinic-level analyses, opposed to PCP level analyses. This drops 30% of treated clinics. Analyses without this restriction were run for robustness and showed that the number of visits at non-focal clinics decreased in response to a focal-PCP departure, which is unintuitive and suggests that clinic boundaries were likely incorrect in this case.

Figure A2: PCPs per Group Over Time



Notes: Graphs rely on a sample that matches *clinics*, instead of PCPs, which is described in Appendix B. Figure 9b shows the number of PCPs per group over time. The average number of exiting PCPs does not go to zero at $t = 1$, instead showing that there are subsequent departures at the group. PCPs that exit after the focal PCP departure in $t = 0$ gradually exit over the two year post period.

Table A4: Balance Table for PCPs and Patients by Length of Relationship

	Only Treated PCPs and Patients		
	6-14 Yrs	2-5 Yr	
	Mean (sd)	Mean (sd)	Normalized Diff.
PCP Matching Covariates 3 Years Prior to PCP Exit			
Avg PCP Age (yr)	54.8(11.9)	52.6(12.2)	0.18
Caseload per PCP/Month	16.5(11.8)	14.4(11.4)	0.18
PCP Covariates That Were Not Matched On			
PCPs Per Practice	9.1(12.7)	9.6(13.0)	0.041
Avg Pop. in Zip	26478(15557.2)	26404(15328.3)	0.0048
Median Income in Zip ($)	55162(22958.4)	54655(22697.1)	0.022
Individual Model Clinic	0.48(0.50)	0.45(0.50)	0.071
Outcomes That Were Not Matched On			
Patient Demographics			
Patient Age (yr)	81.6(3.3)	82.0(3.3)	0.13
PCP-Patient Bond (yr)	4.9(0.63)	2.2(0.64)	4.2
Max SP Relationship Length (yr)	2.2(2.6)	1.4(2.1)	0.33
Patient Clinical Characteristics			
Elixhauser Score	2.7(1.3)	2.6(1.2)	0.041
End Stage Renal Disease (%)	0.33(3.6)	0.46(4.0)	0.034
Also Enrolled in Medicaid (%)	12.0(24.6)	13.2(24.5)	0.051
Average Annual Rate per Patient, 2-3 Years Before Exit			
Primary Care Visits	6.1(3.8)	5.4(3.5)	0.21
No. of PCPs Seen	2.4(1.2)	2.3(1.1)	0.068
Specialist Visits	9.7(7.6)	9.3(7.3)	0.054
No. of Specialists Seen	5.0(3.2)	4.0(2.9)	0.34
ED Visits per 100 Beneficiaries	0.65(0.86)	0.65(0.84)	0.0011
Inpatient Visits per 100 Beneficiaries	0.38(0.57)	0.41(0.58)	0.038
Annual Patient Expense ($)	973.93(1556.28)	1127.65(1537.55)	0.099
Annual Spending ($)	7937.41(20024.14)	7613.44(18990.88)	0.017
Prob. of Death (%)	0.055(0.41)	0.100(0.49)	0.099

Notes: "Normalized Diff." stands for normalized difference. The underlying sample follows treatment and control patients 1 year after a PCP's exit. See Table 1 for a further description of outcomes. Values are as of 3 years before a PCP's exit, unless otherwise noted.

Table A5: Balance Table for PCPs and Patients by Whether Clinic Closed or Remained Open

	Only Treated PCPs and Patients		
	Closed	Open	
	Mean (sd)	Mean (sd)	Normalized Diff.
PCP Matching Covariates 3 Years Prior to PCP Exit			
Avg PCP Age (yr)	61.0(11.6)	51.8(11.8)	0.78
Caseload per PCP/Month	12.6(10.6)	12.2(10.6)	0.034
PCP Covariates That Were Not Matched On			
PCPs Per Practice	1.5(2.2)	12.6(14.4)	1.1
Avg Pop. in Zip	28525(17440.8)	26349(15119.6)	0.13
Median Income in Zip ($)	56176(23496.0)	54431(22399.7)	0.076
Individual Model Clinic	0.68(0.47)	0.36(0.48)	0.67
Outcomes That Were Not Matched On			
Patient Demographics			
Patient Age (yr)	71.8(5.9)	71.2(6.0)	0.10
White (%)	82.2(25.6)	87.1(20.3)	0.21
Female (%)	37.0(18.9)	36.0(20.0)	0.050
Urban (%)	81.9(38.5)	81.0(39.2)	0.022
Patient Clinical Characteristics			
Elixhauser Score	2.5(0.87)	2.4(0.80)	0.12
End Stage Renal Disease (%)	0.88(3.0)	0.84(3.2)	0.011
Also Enrolled in Medicaid (%)	20.4(24.1)	18.7(21.3)	0.076
Average Annual Rate per Patient, 36-24 Months Before Exit			
Primary Care Visits	5.7(3.1)	5.5(2.6)	0.074
No. of PCPs Seen	2.0(0.64)	2.7(1.0)	0.85
Specialist Visits	9.6(4.8)	9.3(4.8)	0.057
No. of Specialists Seen	4.5(2.0)	4.5(2.0)	0.0022
ED Visits per 100 Beneficiaries	0.66(0.75)	0.68(0.65)	0.039
Inpatient Visits per 100 Beneficiaries	0.34(0.32)	0.35(0.31)	0.062
Annual Patient Expense ($)	957.85(887.75)	962.06(866.53)	0.0048
Annual Spending ($)	10618.53(15999.18)	9193.84(12850.10)	0.098
Prob. of Death (%)	0.042(0.16)	0.047(0.20)	0.031

Notes: "Normalized Diff." stands for normalized difference. The underlying sample follows treatment and control patients 1 year after a PCP's exit. See Table 1 for a further description of outcomes. Values are as of 3 years before a PCP's exit, unless otherwise noted.

Table A6: Balance Table for Clinics by Individual or Shared

	Only Treated Clinics and Patients		
	Panel	Shared	
	Mean (sd)	Mean (sd)	Normalized Diff.
Clinic Matching Covariates 3 Years Prior to PCP Exit			
Avg PCP Age (yr)	56.0(12.7)	53.0(12.0)	0.24
Caseload per PCP/Month	13.4(11.2)	11.4(10.0)	0.20
Clinic Covariates That Were Not Matched On			
Share of Practice that is Female	0.30(0.34)	0.39(0.28)	0.27
Share of Practice that are APs	0.070(0.17)	0.13(0.20)	0.33
PCPs Per Practice	6.8(11.8)	11.8(14.0)	0.38
Avg Pop. in Zip	27656(16772.7)	26373(14979.5)	0.081
Median Income in Zip ($)	55203(23055.2)	54676(22441.6)	0.023
Outcomes That Were Not Matched On			
Patient Demographics			
Patient Age (yr)	71.8(5.9)	71.1(6.0)	0.11
PCP-Patient Bond (yr)	4.9(2.0)	4.4(2.0)	0.28
White (%)	84.4(23.2)	86.9(20.8)	0.11
Female (%)	38.0(17.9)	34.9(21.0)	0.16
Urban (%)	81.3(39.0)	81.2(39.1)	0.0045
Patient Clinical Characteristics			
Elixhauser Score	2.5(0.83)	2.3(0.80)	0.26
End Stage Renal Disease (%)	0.84(3.0)	0.86(3.2)	0.0075
Also Enrolled in Medicaid (%)	19.9(23.0)	18.6(21.4)	0.061
Average Annual Rate per Patient, 36-24 Months Before Exit			
Primary Care Visits	6.0(3.2)	5.1(2.2)	0.31
No. of PCPs Seen	2.2(0.79)	2.7(1.0)	0.50
Specialist Visits	9.3(4.5)	9.4(5.0)	0.0098
No. of Specialists Seen	4.6(2.0)	4.4(2.0)	0.12
ED Visits per 100 Beneficiaries	0.68(0.70)	0.67(0.66)	0.018
Inpatient Visits per 100 Beneficiaries	0.36(0.31)	0.34(0.32)	0.040
Annual Patient Expense ($)	988.86(824.89)	937.92(909.02)	0.059
Annual Spending ($)	10110.26(13376.20)	9159.41(14139.53)	0.069
Prob. of Death (%)	0.047(0.18)	0.045(0.20)	0.0083

Notes: "Normalized Diff." stands for normalized difference. The underlying sample follows treatment and control patients 1 year after a PCP's exit. See Table 1 for a further description of outcomes. Values are as of 3 years before a PCP's exit, unless otherwise noted.

Table A7: Balance Table for PCPs and Patients by Patient Risk Status

	Only Treated PCPs and Patients		
	High Risk	Not High Risk	
	Mean (sd)	Mean (sd)	Normalized Diff.
PCP Matching Covariates 3 Years Prior to PCP Exit			
Avg PCP Age (yr)	52.9(12.2)	52.8(12.3)	0.0041
Caseload per PCP/Month	13.1(11.1)	13.0(11.0)	0.0043
PCP Covariates That Were Not Matched On			
PCPs Per Practice	8.5(11.9)	8.5(11.9)	0.0017
Avg Pop. in Zip	26889(15907.2)	26965(15894.6)	0.0048
Median Income in Zip ($)	54365(22393.5)	54496(22466.1)	0.0058
Individual Model Clinic	0.45(0.50)	0.46(0.50)	0.0035
Outcomes That Were Not Matched On			
Patient Demographics			
Patient Age (yr)	73.5(7.6)	71.3(6.4)	0.32
PCP-Patient Bond (yr)	4.1(1.8)	4.0(1.6)	0.096
White (%)	86.6(25.1)	86.9(21.9)	0.011
Female (%)	35.3(27.1)	35.9(20.7)	0.024
Urban (%)	80.8(39.4)	81.1(39.2)	0.0077
Patient Clinical Characteristics			
Elixhauser Score	4.5(1.3)	1.6(0.70)	2.8
End Stage Renal Disease (%)	1.8(7.2)	0.47(2.8)	0.24
Also Enrolled in Medicaid (%)	20.3(27.6)	18.0(22.2)	0.092
Average Annual Rate per Patient, 2-3 Years Before Exit			
Primary Care Visits	7.5(4.4)	5.0(2.4)	0.70
No. of PCPs Seen	2.7(1.4)	2.4(0.90)	0.30
Specialist Visits	13.7(8.3)	7.4(4.2)	1.0
No. of Specialists Seen	6.3(3.3)	3.9(1.9)	0.91
ED Visits per 100 Beneficiaries	1.0(1.2)	0.53(0.58)	0.51
Inpatient Visits per 100 Beneficiaries	0.65(0.71)	0.27(0.30)	0.70
Annual Patient Expense ($)	1614.60(1750.44)	708.74(793.87)	0.67
Annual Spending ($)	12263.98(23311.81)	5238.54(10517.59)	0.39
Prob. of Death (%)	0.068(0.37)	0.033(0.18)	0.12

Notes:"Normalized Diff." stands for normalized difference. The underlying sample follows treatment and control patients 4 years after a PCP's exit. See Table 1 for a further description of outcomes. Values are as of 3 years before a PCP's exit, unless otherwise noted.

Table A8: Balance Table for PCPs and Patients by Disability Status

	Only Treated PCPs and Patients		
	Disabled	Not Disabled	
	Mean (sd)	Mean (sd)	Normalized Diff.
PCP Matching Covariates 3 Years Prior to PCP Exit			
Avg PCP Age (yr)	53.1(12.2)	52.8(12.3)	0.024
Caseload per PCP/Month	14.3(11.3)	12.9(11.0)	0.13
PCP Covariates That Were Not Matched On			
PCPs Per Practice	8.5(12.0)	8.5(11.9)	0.00079
Avg Pop. in Zip	26702(15850.4)	26911(15888.8)	0.013
Median Income in Zip ($)	54288(22427.1)	54432(22411.3)	0.0065
Individual Model Clinic	0.47(0.50)	0.45(0.50)	0.034
Outcomes That Were Not Matched On			
Patient Demographics			
Patient Age (yr)	71.6(8.9)	72.0(6.1)	0.055
PCP-Patient Bond (yr)	4.3(1.9)	4.0(1.6)	0.20
White (%)	88.1(23.6)	86.6(22.3)	0.067
Female (%)	30.8(26.5)	37.2(21.0)	0.27
Urban (%)	80.3(39.8)	81.0(39.3)	0.017
Patient Clinical Characteristics			
Elixhauser Score	2.8(1.2)	2.3(0.82)	0.54
End Stage Renal Disease (%)	1.0(5.9)	0.76(3.3)	0.056
Also Enrolled in Medicaid (%)	22.1(28.2)	17.5(22.2)	0.18
Average Annual Rate per Patient, 2-3 Years Before Exit			
Primary Care Visits	6.8(3.9)	5.2(2.6)	0.48
No. of PCPs Seen	2.7(1.3)	2.4(0.93)	0.30
Specialist Visits	12.5(8.3)	8.2(4.4)	0.65
No. of Specialists Seen	6.0(3.4)	4.1(1.9)	0.68
ED Visits per 100 Beneficiaries	1.1(1.8)	0.53(0.50)	0.42
Inpatient Visits per 100 Beneficiaries	0.59(0.69)	0.31(0.32)	0.52
Annual Patient Expense ($)	1497.48(1817.27)	792.97(825.66)	0.50
Annual Spending ($)	12100.46(24715.35)	5545.47(10483.62)	0.34
Prob. of Death (%)	0.051(0.34)	0.040(0.20)	0.040

Notes: "Normalized Diff." stands for normalized difference. The underlying sample follows treatment and control patients 4 years after a PCP's exit. See Table 1 for a further description of outcomes. Values are as of 3 years before a PCP's exit, unless otherwise noted.

Table A9: Balance Table for PCPs and Patients by Patient Race

	Only Treated PCPs and Patients		
	Minority	White	
	Mean (sd)	Mean (sd)	Normalized Diff.
PCP Matching Covariates 3 Years Prior to PCP Exit			
Avg PCP Age (yr)	53.6(12.3)	52.7(12.2)	0.073
Caseload per PCP/Month	15.5(12.3)	13.1(11.1)	0.20
PCP Covariates That Were Not Matched On			
PCPs Per Practice	8.2(11.8)	8.6(11.9)	0.038
Avg Pop. in Zip	27815(16484.3)	26797(15729.8)	0.063
Median Income in Zip ($)	54335(23083.8)	54588(22551.1)	0.011
Individual Model Clinic	0.49(0.50)	0.45(0.50)	0.084
Outcomes That Were Not Matched On			
Patient Demographics			
Patient Age (yr)	68.0(11.0)	72.2(6.1)	0.47
PCP-Patient Bond (yr)	4.0(1.9)	4.0(1.6)	0.021
White (%)	–(–)	100.0(–)	–
Female (%)	36.7(34.7)	35.9(20.9)	0.026
Urban (%)	84.4(36.3)	80.8(39.4)	0.096
Patient Clinical Characteristics			
Elixhauser Score	2.5(1.4)	2.4(0.84)	0.13
End Stage Renal Disease (%)	2.2(9.8)	0.54(2.5)	0.24
Also Enrolled in Medicaid (%)	37.3(37.7)	16.1(21.0)	0.69
Average Annual Rate per Patient, 2-3 Years Before Exit			
Primary Care Visits	5.5(4.2)	5.6(2.7)	0.022
No. of PCPs Seen	2.4(1.4)	2.5(1.0)	0.099
Specialist Visits	7.8(7.9)	9.3(4.9)	0.23
No. of Specialists Seen	4.0(3.2)	4.6(2.1)	0.21
ED Visits per 100 Beneficiaries	0.86(2.2)	0.64(0.80)	0.13
Inpatient Visits per 100 Beneficiaries	0.39(0.69)	0.37(0.38)	0.025
Annual Patient Expense ($)	1017.90(1790.70)	953.53(1013.36)	0.044
Annual Spending ($)	9150.16(23920.29)	6955.02(13342.86)	0.11
Prob. of Death (%)	0.018(0.20)	0.044(0.20)	0.13

Notes: "Normalized Diff." stands for normalized difference. The underlying sample follows treatment and control patients 4 years after a PCP's exit. See Table 1 for a further description of outcomes. Values are as of 3 years before a PCP's exit, unless otherwise noted.

Table A10: Balance Table for PCPs and Patients by
Female Patients versus Male Patients Matched with Female PCPs

	Only Treated PCPs and Patients		
	Female-Female	Male-Female	
	Mean (sd)	Mean (sd)	Normalized Diff.
PCP Matching Covariates 3 Years Prior to PCP Exit			
Avg PCP Age (yr)	47.6(10.0)	47.0(9.8)	0.052
Caseload per PCP/Month	9.4(7.5)	10.7(8.0)	0.17
PCP Covariates That Were Not Matched On			
PCPs Per Practice	9.3(12.3)	9.3(12.2)	0.000072
Avg Pop. in Zip	27284(15980.5)	26991(16012.4)	0.018
Median Income in Zip ($)	55455(22992.0)	54713(22854.0)	0.032
Individual Model Clinic	0.41(0.49)	0.44(0.50)	0.060
Outcomes That Were Not Matched On			
Patient Demographics			
Patient Age (yr)	72.2(6.4)	69.1(8.9)	0.40
PCP-Patient Bond (yr)	5.6(1.4)	5.5(1.7)	0.048
White (%)	85.7(23.6)	85.3(26.5)	0.019
Female (%)	100.0(–)	–(–)	–
Urban (%)	82.6(37.9)	80.7(39.5)	0.050
Patient Clinical Characteristics			
Elixhauser Score	2.4(0.89)	2.5(1.2)	0.082
End Stage Renal Disease (%)	0.62(3.4)	1.1(6.1)	0.10
Also Enrolled in Medicaid (%)	20.3(24.4)	19.7(27.5)	0.022
Average Annual Rate per Patient, 36-24 Months Before Exit			
Primary Care Visits	5.6(2.8)	5.2(3.5)	0.12
No. of PCPs Seen	2.8(1.1)	2.4(1.1)	0.33
Specialist Visits	9.4(5.2)	9.2(6.6)	0.035
No. of Specialists Seen	4.7(2.3)	4.4(2.9)	0.12
ED Visits per 100 Beneficiaries	0.61(0.74)	0.74(1.1)	0.14
Inpatient Visits per 100 Beneficiaries	0.32(0.34)	0.42(0.60)	0.21
Annual Patient Expense ($)	853.96(842.12)	1050.00(1454.51)	0.17
Annual Spending ($)	6881.84(14062.10)	7264.03(20183.08)	0.022
Prob. of Death (%)	0.039(0.22)	0.048(0.32)	0.034

Notes: "Normalized Diff." stands for normalized difference. The underlying sample follows treatment and control patients 4 years after a PCP's exit. See Table 1 for a further description of outcomes. Values are as of 3 years before a PCP's exit, unless otherwise noted.

Table A11: Balance Table for PCPs and Patients by Dual Eligible (DE) Status

	Only Treated PCPs and Patients		
	DE	Not DE	
	Mean (sd)	Mean (sd)	Normalized Diff.
PCP Matching Covariates 3 Years Prior to PCP Exit			
Avg PCP Age (yr)	52.4(12.1)	52.8(12.3)	0.034
Caseload per PCP/Month	15.1(11.8)	13.1(11.1)	0.18
PCP Covariates That Were Not Matched On			
PCPs Per Practice	8.4(11.7)	8.6(12.0)	0.013
Avg Pop. in Zip	26412(16152.4)	26664(15693.0)	0.016
Median Income in Zip ($)	52278(21173.1)	54532(22503.5)	0.10
Individual Model Clinic	0.47(0.50)	0.45(0.50)	0.037
Outcomes That Were Not Matched On			
Patient Demographics			
Patient Age (yr)	63.5(12.2)	73.8(4.9)	1.1
PCP-Patient Bond (yr)	3.9(1.9)	4.0(1.6)	0.098
White (%)	76.1(32.0)	89.6(20.3)	0.51
Female (%)	31.4(29.7)	36.6(21.6)	0.20
Urban (%)	77.5(41.8)	80.6(39.5)	0.076
Patient Clinical Characteristics			
Elixhauser Score	2.6(1.3)	2.3(0.83)	0.20
End Stage Renal Disease (%)	1.7(8.1)	0.60(2.9)	0.18
Also Enrolled in Medicaid (%)	100.0(–)	–(–)	–
Average Annual Rate per Patient, 36-24 Months Before Exit			
Primary Care Visits	6.0(4.0)	5.5(2.6)	0.16
No. of PCPs Seen	2.6(1.4)	2.4(0.94)	0.12
Specialist Visits	8.1(7.2)	9.2(4.8)	0.19
No. of Specialists Seen	4.1(3.0)	4.5(2.1)	0.18
ED Visits per 100 Beneficiaries	1.2(1.7)	0.51(0.46)	0.58
Inpatient Visits per 100 Beneficiaries	0.54(0.72)	0.33(0.34)	0.36
Annual Patient Expense ($)	1331.98(1796.62)	866.47(922.34)	0.33
Annual Spending ($)	16416.87(34792.80)	4781.70(10520.62)	0.45
Prob. of Death (%)	0.043(0.32)	0.042(0.20)	0.0022

Notes: "Normalized Diff." stands for normalized difference. The underlying sample follows treatment and control patients 4 years after a PCP's exit. See Table 1 for a further description of outcomes. Values are as of 3 years before a PCP's exit, unless otherwise noted.

Table A12: Balance Table for PCPs and Patients by Length of Relationship

	Only Treated PCPs and Patients		
	8-12 Yrs	2-7 Yrs	
	Mean (sd)	Mean (sd)	Normalized Diff.
PCP Matching Covariates 3 Years Prior to PCP Exit			
Avg PCP Age (yr)	58.5(11.1)	52.4(12.2)	0.53
Caseload per PCP/Month	17.0(12.2)	14.0(11.3)	0.26
PCP Covariates That Were Not Matched On			
PCPs Per Practice	8.5(12.6)	8.6(11.9)	0.0044
Avg Pop. in Zip	26746(15918.5)	26689(15699.2)	0.0036
Median Income in Zip ($)	55066(22732.3)	54338(22312.7)	0.032
Individual Model Clinic	0.51(0.50)	0.46(0.50)	0.12
Outcomes That Were Not Matched On			
Patient Demographics			
Patient Age (yr)	81.5(2.7)	81.9(2.8)	0.14
PCP-Patient Bond (yr)	9.4(1.1)	4.9(0.90)	4.4
Max SP Relationship Length (yr)	1.5(2.0)	0.87(1.3)	0.38
Patient Clinical Characteristics			
Elixhauser Score	2.7(1.1)	2.6(1.1)	0.039
End Stage Renal Disease (%)	0.34(3.4)	0.44(3.4)	0.031
Also Enrolled in Medicaid (%)	10.4(21.6)	12.8(22.2)	0.11
Average Annual Rate per Patient, 2-3 Years Before Exit			
Primary Care Visits	6.2(3.2)	5.7(3.2)	0.18
No. of PCPs Seen	2.4(1.1)	2.3(1.0)	0.030
Specialist Visits	9.7(6.6)	9.1(6.2)	0.10
No. of Specialists Seen	5.2(2.6)	4.2(2.6)	0.36
ED Visits per 100 Beneficiaries	0.57(0.63)	0.60(0.67)	0.052
Inpatient Visits per 100 Beneficiaries	0.35(0.46)	0.40(0.48)	0.088
Annual Patient Expense ($)	884.56(1024.72)	1050.85(1254.41)	0.14
Annual Spending ($)	7506.83(14425.82)	5664.50(13301.80)	0.13
Prob. of Death (%)	0.025(0.18)	0.082(0.39)	0.19

Notes: "Normalized Diff." stands for normalized difference. The underlying sample follows treatment and control patients 4 years after a PCP's exit. See Table 1 for a further description of outcomes. Values are as of 3 years before a PCP's exit, unless otherwise noted.

Table A13: Balance Table for PCPs and Patients by Local Density of PCPs

	Only Treated PCPs and Patients		
	High PCP Density	Low PCP Density	
	Mean (sd)	Mean (sd)	Normalized Diff.
PCP Matching Covariates 3 Years Prior to PCP Exit			
Avg PCP Age (yr)	54.4(12.4)	53.8(12.3)	0.048
Caseload per PCP/Month	12.4(10.7)	10.8(9.2)	0.16
PCP Covariates That Were Not Matched On			
PCPs Per Practice	9.5(13.3)	9.2(13.8)	0.027
Avg Pop. in Zip	28344(15279.3)	5187(3487.5)	2.1
Median Income in Zip ($)	55005(22245.0)	53484(29146.7)	0.059
Individual Model Clinic	0.45(0.50)	0.42(0.49)	0.063
Outcomes That Were Not Matched On			
Patient Demographics			
Patient Age (yr)	71.4(6.0)	71.4(5.8)	0.0026
PCP-Patient Bond (yr)	4.6(2.0)	4.5(2.0)	0.032
White (%)	85.7(22.0)	87.2(22.0)	0.069
Female (%)	36.1(19.7)	38.2(20.2)	0.10
Urban (%)	81.7(38.7)	74.1(43.8)	0.18
Patient Clinical Characteristics			
Elixhauser Score	2.4(0.82)	2.3(0.80)	0.12
End Stage Renal Disease (%)	0.84(3.1)	1.0(3.1)	0.043
Also Enrolled in Medicaid (%)	19.3(22.3)	17.9(19.5)	0.067
Average Annual Rate per Patient, 2-3 Years Before Exit			
Primary Care Visits	5.5(2.8)	5.5(2.2)	0.010
No. of PCPs Seen	2.5(1.0)	2.5(1.0)	0.039
Specialist Visits	9.4(4.8)	8.5(4.5)	0.20
No. of Specialists Seen	4.5(2.0)	4.2(1.9)	0.17
ED Visits per 100 Beneficiaries	0.68(0.68)	0.68(0.59)	0.0015
Inpatient Visits per 100 Beneficiaries	0.35(0.31)	0.34(0.31)	0.018
Annual Patient Expense ($)	962.54(875.59)	935.09(821.49)	0.032
Annual Spending ($)	9654.17(13956.46)	8557.54(11195.29)	0.087
Prob. of Death (%)	0.046(0.19)	0.047(0.19)	0.0083

Notes: "Normalized Diff." stands for normalized difference. The underlying sample follows treatment and control patients 1 year after a PCP's exit. See Table 1 for a further description of outcomes. Values are as of 3 years before a PCP's exit, unless otherwise noted.

Table A14: Balance Table for PCPs and Patients by Clinic Size

	Only Treated PCPs and Patients		
	1-3 PCPs	4-100 PCPs	
	Mean (sd)	Mean (sd)	Normalized Diff.
PCP Matching Covariates 2 Years Prior to PCP Exit			
Avg PCP Age (yr)	58.2(12.5)	52.0(11.7)	0.51
Caseload per PCP/Month	12.3(10.4)	12.3(10.7)	0.0060
PCP Covariates That Were Not Matched On			
PCPs Per Practice	1.3(0.45)	14.7(14.8)	1.3
Avg Pop. in Zip	27796(17292.9)	26423(14811.6)	0.085
Median Income in Zip ($)	55774(23518.0)	54376(22192.8)	0.061
Individual Model Clinic	0.66(0.48)	0.32(0.47)	0.70
Outcomes That Were Not Matched On			
Patient Demographics			
Patient Age (yr)	71.5(6.0)	71.3(6.0)	0.042
PCP-Patient Bond (yr)	4.9(2.0)	4.4(2.0)	0.27
White (%)	82.5(25.1)	87.8(19.5)	0.23
Female (%)	36.9(19.0)	35.9(20.2)	0.054
Urban (%)	81.4(38.9)	81.1(39.1)	0.0072
Patient Clinical Characteristics			
Elixhauser Score	2.5(0.87)	2.4(0.79)	0.16
End Stage Renal Disease (%)	0.90(3.0)	0.82(3.2)	0.025
Also Enrolled in Medicaid (%)	21.2(24.3)	17.9(20.6)	0.14
Average Annual Rate per Patient, 2-3 Years Before Exit			
Primary Care Visits	5.7(3.4)	5.4(2.3)	0.096
No. of PCPs Seen	2.0(0.66)	2.8(1.0)	0.83
Specialist Visits	9.6(5.1)	9.2(4.6)	0.094
No. of Specialists Seen	4.5(2.0)	4.5(2.0)	0.0019
ED Visits per 100 Beneficiaries	0.68(0.70)	0.67(0.66)	0.0044
Inpatient Visits per 100 Beneficiaries	0.35(0.30)	0.35(0.32)	0.021
Annual Patient Expense ($)	970.88(859.03)	954.65(880.69)	0.019
Annual Spending ($)	10167.06(14099.96)	9226.39(13610.85)	0.068
Prob. of Death (%)	0.043(0.18)	0.047(0.20)	0.019

Notes: "Normalized Diff." stands for normalized difference. The underlying sample follows treatment and control patients 1 year after a PCP's exit. See Table 1 for a further description of outcomes. Values are as of 3 years before a PCP's exit, unless otherwise noted.

Appendix C Additional Results

Table A15: Additional Outcomes

Type	Mean	Impact	Type	Mean	Impact
Count of PCP Departures	0.095	0.024*** (0.0025) 25.5%	**Type of Visit**		
Count of Strong Departures	0.053	0.077*** (0.0064) 144.1%	Prob. of Any PCP EM Visit	3.2	-0.48*** (0.012) -14.9%
Prob. of Enrolling in MA	0.0000027	0.0000082 (0.0000053) 301.1%	Prob. Visit Pre-Existing PCP	3.1	-0.64 (0.012) -20.6%
Tot. Spending on ED and IP	8.8	0.032** (0.012) —	Prob. Form New PCP Relationship	0.12	0.16 (0.0031) 134.7%
ED Classification Outcomes			Prob. of Any SP EM Visit	3.1	0.22*** (0.0081) 7.0%
No. of ED Visits, Preventable	0.076	0.0022 (0.0010) 2.9%	Prob. Visit Pre-Existing SP	2.6	0.16*** (0.0078) 6.1%
No. of ED Visits, Not Preventable	0.19	0.0080 (0.0018) 4.3%	Prob. Form New SP Relationship	0.45	0.056*** (0.0029) 12.3%
No. of ED Visits, Primary Care Treatable	0.17	0.0039 (0.0016) 2.3%	**Timing of Visits**		
No. of ED for Non-Emergent	0.25	0.013 (0.0020) 5.3%	Mo. Since Visited Any PCP	2.7	0.077 (0.0093) 2.8%
No. of ED for Injury	0.25	0.011 (0.0029) 4.6%	Mo. Since Visited Any SP	2.1	-0.035 (0.0048) -1.7%

Notes: The table displays results from the difference-in-differences specification outlined in Section 3.3 where patients are followed one year after a PCP's exit. "Prob." indicates that the outcome is the yearly probability. Regressions are at the PCP-year level, contain pre-departure PCP fixed effects, and cluster at the PCP-match level. Stars indicate significance at the 10% (*), 5% (**), and 1% (***) level. Data relies on the main sample shown in Table 1, which only follows patients for one year post-departure.

Table A16: Treatment Effect of PCP Unexpectedly Leaving Practice

Type	Mean	Impact Year 1 Post Exit	Impact Year 2 Post Exit	Impact Year 3 Post Exit	Impact Year 4 Post Exit
Utilization of Services					
No. of Primary Care Visits	5.0	-0.69*** (0.028) -13.7%	-0.72*** (0.030) -14.4%	-0.74*** (0.031) -14.6%	-0.73*** (0.032) -14.5%
No. of Specialist Visits	9.1	0.40*** (0.039) 4.4%	0.30*** (0.041) 3.3%	0.28*** (0.044) 3.0%	0.18*** (0.046) 2.0%
Aggregate Markers for Poor Care					
No. of ED and Inpatient Visits	0.87	0.029*** (0.0061) 3.3%	0.0054 (0.0063) 0.62%	-0.0099 (0.0066) -1.1%	0.0043 (0.0070) 0.49%
Prob. of Death	0.054	0.0011 (0.0010) 2.1%	0.00068 (0.0010) 1.3%	-0.00090 (0.0011) -1.7%	-0.00058 (0.0011) -1.077%

Notes: The table displays results from the difference-in-differences specification outlined in Section 3.3, except patients are followed four years after a PCP's exit. "Prob." indicates that the outcome is the yearly probability and "No." indicates that the outcome is the yearly number. Total service utilization includes primary care, specialty care, urgent care, emergency department, and inpatient utilization. Regressions are at the PCP-year level, contain pre-departure PCP fixed effects, and cluster at the PCP-match level. Stars indicate significance at the 10% (*), 5% (**), and 1% (***) level. Data relies on a sample that follows patients for four years post-departure.

Table A17: Treatment Effect of a PCP Leaving a Clinic with Practice Size Match

Type	Mean	Impact	Type	Mean	Impact
Utilization of Clinic Based Services			**Medications**		
No. of Primary Care Visits	5.0	-0.78*** (0.025) -15.6%	No. of Filled Prescriptions	15.4	0.33*** (0.091) 2.1%
No. of Specialist Visits	9.4	0.49*** (0.034) 5.3%	No. of Chronic Med RX Fills	5.7	0.18*** (0.035) 3.2%
Log Tot. Spending	9.4	0.028*** (0.0097) —	**Aggregate Markers for Poor Care**		
			No. of ED and Inpatient Visits	0.88	0.043*** (0.0055) 4.9%
Preventive Care					
Tot. Amount of Preventive Care	2.0	-0.081*** (0.013) -4.0%	Treated PCP Sample Size	11746	
			Control PCP Sample Size	11746	

Notes: The table displays results from the difference-in-differences specification outlined in Section 3.3, where patients are followed one year after a PCP's exit and seven coarsened bins of practice size are added to the match. "Prob." indicates that the outcome is the yearly probability and "No." indicates that the outcome is the yearly number. Regressions are at the PCP-year level, contain pre-departure PCP fixed effects, and cluster at the PCP-match level. Stars indicate significance at the 10% (*), 5% (**), and 1% (***) level. See Section A.1 for how medications were defined.

Table A18: Additional Results

Type	Mean	Impact
Additional Medication Results		
No. of RX Starts	1.2	0.079*** (0.0094) 6.7%
No. of RX Ends	0.93	0.026*** (0.0066) 2.9%
No. of RX Classes Started	0.84	0.060*** (0.0083) 7.1%
No. of RX Classes Ended	0.56	0.013** (0.0051) 2.3%
No. of RX Switches	0.17	0.014*** (0.0017) 7.9%
No. of Opioid RX	0.87	-0.013 (0.0065) -1.5%
No. of Benzo RX	0.12	-0.014 (0.0049) -12.2%
No. of SSRI RX	0.96	0.017 (0.0067) 1.8%
No. of Antihypertensive RX	2.8	-0.0068 (0.015) -0.24%
No. of Antidiabetic RX	0.85	-0.011 (0.0068) -1.3%
No. of Statin RX	1.3	-0.012 (0.0074) -0.97%
Sampling of Sub-Specialties		
No. of Nephrologist Visits	0.14	0.027 (0.0031) 18.8%
No. of Cardiologist Visits	0.93	0.057 (0.0066) 6.1%
No. of Gastroenterologists Visits	0.19	0.017 (0.0025) 9.3%
No. of Surgeon Visits	0.72	0.011 (0.0054) 1.5%

Type	Mean	Impact
Preventive Care in Retail Setting		
Prob. of a Flu Vaccine by Retail	0.18	0.014*** (0.0017) 7.6%
No. of Preventive Screens by Retail	0.35	0.10*** (0.0090) 29.3%
Additional Screens		
No. of Depression Screens	0.015	0.0043 (0.0034) 28.9%
No. of Mammography Screens	0.82	0.0081 (0.0078) 0.98%
No. of Colorectal Cancer Screens	0.15	-0.0041 (0.0031) -2.8%
No. of Diabetes Screens	0.095	-0.013*** (0.0025) -13.6%
No. of BMI Screens	0.018	-0.0078 (0.0022) -44.1%
No. of Tobacco Screens	0.022	0.00091 (0.0015) 4.2%
No. of Bone Density Screens	0.078	0.012*** (0.0011) 15.6%
No. of Cholesterol Screens	0.71	-0.027*** (0.0048) -3.8%

Notes: The table displays results from the difference-in-differences specification outlined in Section 3.3, where patients are followed one year after a PCP's exit (see Table 1 for baseline balance). "No." indicates that the outcome is the yearly number. Regressions are at the PCP-year level, contain pre-departure PCP fixed effects, and cluster at the PCP-match level. Stars indicate significance at the 10% (*), 5% (**), and 1% (***) level. "RX Start" signifies that the patient had not been on that particular prescription before. "RX End" signifies that the prescription fill was the last prescription of that particular drug. "RX Classes Started" tags a new drug in a class of drugs that the patient was not previously prescribed. "RX Classes Ended" tages the end of a class of drugs. "RX Switches" is a different drug within the same class of drugs.

Table A19: Shift of Care from Primary Care to Specialty Setting

PCP Administered Type	Mean	Impact	**Specialist Administered** Type	Mean	Impact
Medications					
No. of Filled Prescriptions from PCP	10.4	-0.79*** (0.062) -7.5%	No. of Filled Prescriptions from Specialists	5.2	0.62*** (0.041) 12.0%
No. of Chronic Med RX Fills from PCP	4.3	-0.28*** (0.025) -6.4%	No. of Chronic Med RX Fills from Specialists	1.6	0.26*** (0.016) 16.3%
Preventive Care					
Tot. Amount of Preventive Care by PCP	1.3	-0.29 (0.014) -22.6%	Tot. Amount of Preventive Care by SP	0.31	0.10 (0.0059) 32.9%
Prob. of a Flu Vaccine by PCP	0.26	-0.063*** (0.0025) -24.2%	Prob. of a Flu Vaccine by Specialist	0.039	0.017*** (0.00091) 42.7%
No. of Preventive Screens by PCP	1.00014	-0.21*** (0.013) -20.7%	No. of Preventive Screens by Specialist	0.28	0.081*** (0.0056) 28.6%
No. of Annual Exams by PCP	0.052	-0.023*** (0.0021) -44.3%	No. of Annual Exams by Specialist	0.0032	0.0062*** (0.00044) 191.0%

Notes: The table displays results from the difference-in-differences specification outlined in Section 3.3. "Prob." indicates that the outcome is the yearly probability. "No." and "Tot." indicate that the outcome is the yearly number. Regressions are at the PCP-year level, contain pre-departure PCP fixed effects, and cluster at the PCP-match level. Stars indicate significance at the 10% (*), 5% (**), and 1% (***) level. Data relies on the main sample shown in Table 1, which only follows patients for one year post-departure. The chronic medication category includes Selective Serotonin Reuptake Inhibitors (SSRIs), antihypertensives, antidiabetics, and statins.

Table A20: Treatment Effect of a PCP Leaving a Clinic
by Clinic Environment

	Clinic Also Closed		Clinic Stayed Open				
			Individual		Team		
Type	Mean	Impact	Mean	Impact	Mean	Impact	P-Value
No. of Primary Care Visits	5.1	-1.090*** (0.041) -21.4%	5.3	-0.55*** (0.036) -10.4%	4.7	-0.53*** (0.029) -11.2%	0.64
No. of New PCP Relationships	0.13	0.33*** (0.0060) 250.6%	0.12	**0.10***** (0.0042) 86.8%	0.12	**0.070***** (0.0038) 59.9%	p< 0.001
No. of PCP Visits at Clinic	4.0	-3.5*** (0.034) -87.5%	4.3	**-1.7***** (0.043) -39.8%	3.7	**-1.3***** (0.033) -35.9%	p< 0.001
No. of PCP Visits at Other Clinics	1.100	2.4*** (0.037) 218.6%	1.029	**1.2***** (0.036) 111.8%	0.98	**0.81***** (0.027) 83.2%	p< 0.001
No. of Specialist Visits	9.6	0.77*** (0.045) 8.1%	9.2	**0.54***** (0.045) 5.8%	9.2	**0.23***** (0.045) 2.5%	p< 0.001
Log Tot. Spending	76.2	0.43*** (0.14) 0.57%	75.6	0.31** (0.15) 0.41%	73.3	-0.098 (0.15) -0.13%	0.05
Log Tot. Out of Pocket	34.5	0.72*** (0.19) 2.1%	35.2	0.48*** (0.20) 1.4%	32.1	0.17 (0.20) 0.52%	0.28
Preventive Care							
Tot. Amount of Preventive Care	2.1	-0.087*** (0.019) -4.2%	2.3	-0.047*** (0.019) -2.1%	2.1	-0.072*** (0.021) -3.5%	0.38
No. of Tests/Imaging	5.9	0.094*** (0.026) 1.6%	6.1	**0.077***** (0.023) 1.3%	5.9	**-0.023** (0.021) -0.40%	0.001
Aggregate Markers for Poor Care							
No. of ED and Inpatient Visits	0.84	0.052*** (0.0071) 6.2%	0.87	0.024*** (0.0073) 2.8%	0.87	0.017*** (0.0072) 1.9%	0.45
Treated PCP Sample Size	4608		4341		7697		
Control PCP Sample Size	16646		10603		6043		

Notes: The table displays results from the difference-in-differences specification outlined in Section 3.3. Bolded estimates indicate that the groups are significantly different at the 5% level. "Prob." indicates that the outcome is the yearly probability. "No." and "Tot." indicate that the outcome is the yearly number. Regressions are at the PCP-year level, contain pre-departure PCP fixed effects, and cluster at the PCP-match level. Stars indicate significance at the 10% (*), 5% (**), and 1% (***) level. Data relies on the main sample shown in Table 1, which only follows patients for one year post-departure. See Section 2.2 for more details on how heterogeneity and variables were defined.

Table A21: Treatment Effect of a PCP Leaving a Clinic by Clinic Environment
Matching on Practice Size

	Clinic Also Closed		Clinic Stayed Open				
			Individual		Team		
Type	Mean	Impact	Mean	Impact	Mean	Impact	P-Value
No. of Primary Care Visits	5.1	-1.066*** (0.041) -20.9%	5.4	-0.62*** (0.046) -11.5%	4.7	-0.53*** (0.038) -11.3%	0.11
No. of Specialist Visits	9.6	0.71*** (0.047) 7.4%	9.2	**0.47***** (0.057) 5.1%	9.2	**0.20***** (0.056) 2.2%	p< 0.001
Tot. Amount of Preventive Care	2.1	-0.069*** (0.018) -3.4%	2.1	**-0.055***** (0.021) -2.6%	2.0	**-0.12***** (0.021) -5.9%	0.04
No. of ED and Inpatient Visits	0.85	0.059*** (0.0074) 7.0%	0.92	0.027*** (0.0096) 2.9%	0.89	0.034*** (0.0089) 3.9%	0.56
Treated PCP Sample Size	4573		2846		4327		
Control PCP Sample Size	11746		6216		5530		

Notes: See Table A20 for specification details.

Table A22: Treatment Effect of a PCP Leaving a Clinic by Heterogeneity
by Clinic Environment Matching on Team v. Individual Model

	Clinic Also Closed		Clinic Stayed Open				
			Individual		Team		
Type	Mean	Impact	Mean	Impact	Mean	Impact	P-Value
No. of Primary Care Visits	5.1	-1.087*** (0.043) -21.2%	5.3	-0.54*** (0.036) -10.3%	4.7	-0.51*** (0.029) -10.8%	0.48
No. of Specialist Visits	9.5	0.78*** (0.047) 8.2%	9.3	**0.57***** (0.047) 6.1%	9.2	**0.18***** (0.043) 2.0%	p< 0.001
Tot. Amount of Preventive Care	2.1	-0.088*** (0.019) -4.3%	2.3	-0.048*** (0.019) -2.1%	2.0	-0.086*** (0.017) -4.2%	0.15
No. of ED and Inpatient Visits	0.85	0.049*** (0.0074) 5.8%	0.88	0.016** (0.0076) 1.9%	0.87	0.023*** (0.0069) 2.6%	0.52
Treated PCP Sample Size	4373		4413		6717		
Control PCP Sample Size	15503		7564		7939		

Notes: See Table A20 for specification details.

Table A23: Treatment Effect of a PCP Leaving a Clinic by Patient Status

	25th Percentile Threshold					50th Percentile Threshold					75th Percentile Threshold				
	Individual		Team			Individual		Team			Individual		Team		
Type	Mean	Impact	Mean	Impact	P-Value	Mean	Impact	Mean	Impact	P-Value	Mean	Impact	Mean	Impact	P-Value
No. of Primary Care Visits	5.1	-0.53*** (0.029) -10.3%	4.6	-0.51*** (0.036) -10.9%	0.63	5.4	-0.62*** (0.046) -11.4%	4.8	-0.52*** (0.026) -10.8%	0.07	5.8	**-0.71***** (0.093) -12.3%	4.9	**-0.52***** (0.023) -10.7%	0.04
No. of Specialist Visits	9.2	**0.42***** (0.037) 4.6%	9.3	**0.26***** (0.059) 2.9%	0.03	9.2	**0.59***** (0.055) 6.5%	9.2	**0.25***** (0.039) 2.7%	p< 0.001	9.1	**0.60***** (0.100) 6.5%	9.2	**0.33***** (0.033) 3.6%	0.010
No. of ED and Inpatient Visits	0.87	0.023*** (0.0060) 2.7%	0.88	0.015 (0.0094) 1.7%	0.46	0.89	0.020** (0.0090) 2.3%	0.87	0.019*** (0.0063) 2.2%	0.95	0.92	0.0041 (0.016) 0.45%	0.87	0.023*** (0.0053) 2.6%	0.27
Treated PCP Sample Size	7113		4925			2884		9154			979		11059		
Control PCP Sample Size	12973		3673			8796		7850			4474		12172		

Notes: The table displays results from the difference-in-differences specification outlined in Section 3.3. Stars indicate significance at the 10% (*), 5% (**), and 1% (***) level. Data relies on the main sample shown in Table 1, which only follows patients for one year post-departure. The three sets of results vary how individual versus team clinics were defined. The first set of columns uses a 25th percentile threshold, the second set of columns uses a 50th percentile threshold (or median), and the third set of columns uses a 75th percentile threshold.

Table A24: Treatment Effect of a PCP Leaving a Clinic by Market Heterogeneity
Test for Importance of Local Availability

	Low PCP Density		High PCP Density		
Type	Mean	Impact	Mean	Impact	P-Value
No. of Primary Care Visits	4.9	-0.47*** (0.021) -9.6%	5.0	-0.54*** (0.079) -11.0%	0.38
Prob. Form New PCP Relationship	0.036	0.030*** (0.00081) 83.3%	0.030	0.028*** (0.0031) 93.6%	0.56
No. of Specialist Visits	9.3	0.35*** (0.028) 3.7%	8.4	0.57*** (0.12) 6.9%	0.06
No. of Emergency Department Visits	0.72	0.016*** (0.0039) 2.3%	0.70	0.031** (0.015) 4.5%	0.35
No. of ED Visits, Primary Care Treatable	0.48	0.0090*** (0.0030) 1.9%	0.48	0.022* (0.012) 4.6%	0.28
No. of ED Visits, Not Preventable	0.18	0.0060*** (0.0017) 3.3%	0.17	0.012* (0.0070) 7.0%	0.42
Treated PCP Sample Size	10901		722		
Control PCP Sample Size	15230		836		

Notes: The table displays results from the difference-in-differences specification outlined in Section 3.3, where only open clinics are considered and patients are followed one year after a PCP's exit. Bolded estimates indicate that the groups are significantly different at the 5% level. "Prob." indicates that the outcome is the yearly probability and "No." indicates that the outcome is the yearly number. Regressions are at the PCP-year level, contain pre-departure PCP fixed effects, and cluster at the PCP-match level. Stars indicate significance at the 10% (*), 5% (**), and 1% (***) level. See Section 2.2 for more details on how heterogeneity and variables were defined. Density is defined by the number of PCPs within a 30 mile radius divided by the population . Above average areas are high PCP density and below average areas are low PCP density. Figure 8 shows monthly estimates.

Table A25: Treatment Effect of a PCP Leaving a Clinic
With More Than One Similar Clinic Option

	Similar TIN Surrounding Clinic that Closed				
	No Similar Clinic		At Least One Similar Clinic		
Type	Mean	Impact	Mean	Impact	P-Value
No. of Primary Care Visits	5.1	-0.98*** (0.048) -19.3%	5.1	-1.2*** (0.068) -23.0%	0.13
No. of Specialist Visits	9.7	**0.73***** (0.052) 7.5%	9.5	**0.76***** (0.067) 8.0%	0.003
No. of ED and Inpatient Visits	0.84	0.047*** (0.0083) 5.6%	0.83	0.052*** (0.010) 6.2%	0.14
	Similar TIN Surrounding Open Clinics				
	No Similar Clinic		At Least One Similar Clinic		
Type	Mean	Impact	Mean	Impact	P-Value
No. of Primary Care Visits	5.0	-0.48*** (0.043) -9.6%	4.9	-0.49*** (0.023) -9.9%	0.65
No. of Specialist Visits	9.3	0.34*** (0.054) 3.6%	9.2	0.35*** (0.032) 3.8%	0.62
No. of ED and Inpatient Visits	0.88	0.027*** (0.0083) 3.1%	0.87	0.017*** (0.0052) 1.9%	0.44

Notes: The table displays results from the difference-in-differences specification outlined in Section 3.3. “No.” indicates that the outcome is the yearly number. Regressions are at the PCP-year level, contain pre-departure PCP fixed effects, and cluster at the PCP-match level. Data only includes patients who lost a PCP and clinic. Data relies on the main sample shown in Table 1, which only follows patients for one year post-departure. The bins were determined as above average and below average, where average clinic is not surrounded by a clinic with the same TIN. TIN density is calculated as whether there exists a non-focal clinic with the same TIN as the focal clinic, what I term a “sister clinic.” The average clinic does not have a sister clinic, so I compare clinics with zero to those with at least one sister clinic. Stars indicate significance at the 10% (*), 5% (**), and 1% (***) level.

Table A26: Treatment Effect of a PCP Leaving a Clinic
by Urban/Rural Area

	Rural Area		Urban Area		
Type	Mean	Impact	Mean	Impact	P-Value
No. of Primary Care Visits	5.2	**-0.77***** (0.051) -14.8%	4.9	**-0.41***** (0.021) -8.4%	p< 0.001
No. of Specialist Visits	7.3	0.32*** (0.053) 4.4%	9.7	0.38*** (0.030) 3.9%	0.34
No. of ED and Inpatient Visits	0.97	0.036*** (0.011) 3.7%	0.84	0.014*** (0.0046) 1.6%	0.06
Treated PCP Sample Size	2239		9384		
Control PCP Sample Size	2118		13948		

Notes: The table displays results from the difference-in-differences specification outlined in Section 3.3, which only follows patients for one year post-departure. "No." indicates that the outcome is the yearly number. Regressions are at the PCP-year level, contain pre-departure PCP fixed effects, and cluster at the PCP-match level. Stars indicate significance at the 10% (*), 5% (**), and 1% (***) level.

Table A27: Treatment Effect of PCP Unexpectedly Leaving Practice
on Clinic-Level Outcomes

Type	Mean	Impact Year 1 Post Exit	Impact Year 2 Post Exit	P-Value
Firm Level Outcomes				
Avg Number of Pat Seen Per Month-PCP, Staying PCPs	214.9	**44.1***** (6.0) 20.5%	**38.1***** (6.5) 17.7%	0.02
Avg Number of Pat Seen Per Month-PCP, New PCPs	23.9	**35.7***** (6.1) 149.5%	**38.7***** (6.5) 162.1%	0.04
Count of New PCPs	0.056	0.028*** (0.0064) 51.2%	0.018*** (0.0061) 33.2%	0.10
Treated Clinic Sample Size	1573			
Control Clinic Sample Size	1573			
Indirectly Affected Patients' Outcomes				
Utilization of Clinic Based Services				
No. of Primary Care Visits	5.0	-0.050 (0.046) -1.0080%	-0.0012 (0.055) -0.025%	0.11
No. of Specialist Visits	9.8	-0.030 (0.060) -0.31%	0.091 (0.071) 0.92%	0.02
No. of Urgent Care Visits	0.015	-0.00061 (0.0012) -4.2%	0.00072 (0.0011) 5.0%	0.21
Aggregate Markers for Poor Care				
No. of ED and Inpatient Visits	0.89	0.0033 (0.0091) 0.37%	0.012 (0.0095) 1.3%	0.33
Treated Clinics	1558			
Control Clinics	1558			

Notes: This table displays results from a specification similar to the difference-in-differences specification outlined in Section 3.3, with one large difference: analyses rely on a data set that matches clinics, not PCPs, and follows patients two years post-departure. As a result of the clinic-level match, clinics with only one PCP are not included. Regressions are at the clinic-year level, contain clinic fixed effects, and cluster at the clinic-level. Indirect patients are patients who were never observed to visit a departing PCP. Regressions are at the clinic-year level, contain clinic fixed effects, and cluster at the clinic-level. Stars indicate significance at the 10% (*), 5% (**), and 1% (***) level. See Section 2.2 for variable definitions and Appendix B for more details on how the clinic-level sample was created.

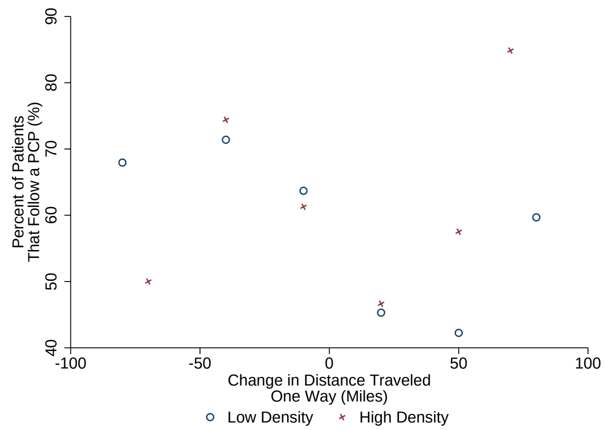
Table A28: Treatment Effect of PCP Leaving Practice
by Whether Open Clinic Practices on Team or Individual Model by Clinic Size

	1-3 PCPs	4-100 PCPs
No. of PCP Visits at Clinic		
Shared	**-1.4*****	**-1.4*****
	(0.068)	(0.038)
	2.9	3.6
	-49.3%	-38.3%
Individual	**-2.0*****†	**-1.7*****†
	(0.080)	(0.052)
	4.0	4.0
	-49.5%	-43.0%
No. of PCP Visits at Other Clinics		
Shared	**0.93*****	**0.82*****
	(0.059)	(0.031)
	1.4	1.066
	67.4%	77.1%
Individual	**1.2*****	**1.2*****
	(0.072)	(0.044)
	1.4	1.057
	87.4%	111.8%
Treated Shared	988	6709
Control Shared	3980	2063
Treated Individual	1145	3196
Control Individual	9672	931

Notes: The table displays results from the difference-in-differences specification outlined in 3.3. Regressions are at the PCP level and contain pre-departure PCP fixed effects. Stars indicate significance at the 10% (*), 5% (**), and 1% (***) level. Bolded estimates mean that shared and panel groups are significantly different at the 5% level and † means that small and large groups are significantly different at the 5% level. Data relies on the main sample shown in Table 1, which only follows patients for one year post departure.

Appendix D Additional Figures

Figure A3: Patients Valuation of PCP Relationships
Using Patients' Willingness-to-Drive



(a) Percent of Patients Following
a Moving PCP by Market Thickness

Notes: The binscatter plots show the percent of patients that follow a PCP by the distance the PCP moves from the original clinic, relative to the patient's zip code of residence. Negative distances indicate that the PCP moved closer to the patient's zip code of residence and positive distances show that the PCP moved farther. Low and high density areas are defined using the local density of PCPs at the original clinic's zip code.