The Impact of Physician Exits in Primary Care: A Study of Practice Handovers

Linn Hjalmarsson [1] Boris Kaiser [2] Tamara Bischof [3]

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Abstract
Recent studies on physician exits suggest that general practitioners (GPs) have an important impact on health care utilization and costs, but the transmission channels – interpersonal discontinuities of care, practice style differences and deterioration in access – are usually not clear. Our objective is to estimate the short-run and long-run impacts of switches in GPs on patients' health care utilization and costs, while all other factors of the health care setting remain the same. To do this, we collect data on handovers of primary care practices in Switzerland, occurring between 2007 and 2015. We link this data to rich insurance claims to construct a panel dataset of roughly 240,000 patients. Employing a difference-in-difference type framework, we find transitory increases in overall visits and costs, which are likely caused by the entering GP's initial re-assessment of patients' health care needs. Additionally, we find long-term increases in specialist health care utilization and ambulatory costs. The latter finding can be explained by changes in practice styles between the exiting GP and her successor, who is typically much younger and more likely to be female. In contrast to the literature on practice closures, we do not find evidence on reduced overall utilization rates. An important lesson for health policy is thus to preserve patients' access to care in the case of GP exits.
Keywords: continuity of care, physician exits, primary care, physician practice styles, health care costs, health care utilization

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[1] Department of Economics, University of Bern, Schanzeneckstrasse 1, 3001 Bern, Switzerland, Email: linn.hjalmarsson@unibe.ch (corresponding author), Phone: +41316314049

[2] BSS Volkswirtschaftliche Beratung, Aeschengraben 9, 4051 Basel, Switzerland, Email: boris.kaiser@bss-basel.ch

[3] Interface Politikstudien Forschung Beratung AG, Seidenhofstrasse 12, 6003 Lucerne, Switzerland, Email: bischof@interface-pol.ch

1 Introduction

Primary care is a cornerstone of the healthcare system, as it is often the first source of care. General practitioners (GPs) not only act as providers of primary care, they also issue referrals and coordinate care across various providers, which helps to curb care fragmentation Agha et al. (2019); Cebul et al. (2008); Frandsen et al. (2015). Moreover, through continuous doctor-patient relationships, GPs accumulate valuable knowledge on patients' health status and health behaviors over time Scott (2000). Therefore, interpersonal continuity of care is often considered to be a key factor in primary care, although the bulk of the evidence only provides descriptive associations (Freeman et al., 2003; Haggerty et al., 2003; Saultz and Lochner, 2005; Cheng et al., 2010; Van Walraven et al., 2010; Wolinsky et al., 2010; Hansen et al., 2013; Leleu and Minvielle, 2013; Nyweide et al., 2013). At the same time, research has also shown that GP practice styles vary considerably, which may strongly influence patients' health care utilization and the associated costs (Kwok, 2019; Fadlon and Van Parys, 2020).

Isolating the causal impact of primary care on utilization and patient outcomes is a challenging task. Physician exits, due to retirement or relocation, provide an ideal framework to analyse the role of primary care because they induce an exogenous change in primary care provision that is typically independent of patient behavior. Physician exits have different implications for patients in the short and long run. First, physician exits disrupt an often long-standing patient-provider relationship. This allows researchers to study the short-run effects of an interpersonal discontinuity of care. Second, once patients rematch to a new GP, they are exposed to a new practice style that persists in the long run. A very recent strand of the literature exploits the exogeneity of physician exits to estimate the causal impact of discontinuities of care on various measures of patient utilization and outcomes. Several studies report a shift from primary to specialist care and increases in costs, especially in settings where patients may have a hard time finding a new GP (e.g., when the exiting GP closes his solo practice) (Bischof and Kaiser, 2021; Sabety et al., 2021; Piwnica-Worms et al., 2021; Staiger, 2022; Zhang, 2022). In contrast, one study finds only minor effects on primary care utilization (Simonsen et al., 2021). A possible reason for the disparate result is that the latter analyses a setting where seamless access to a new GP is maintained, thus highlighting the importance of having access to care. Several studies additionally suggest that a change in GP may ameliorate the quality of care, such as the detection of previously unnoticed chronic conditions (Simonsen et al., 2021; Zhang, 2022).

While these studies all provide credible causal estimates of physician exits, it remains often unclear which transmission channels are at play. For example, when studying practice closures, the effects on utilization can arise from the interpersonal discontinuity, practice style differences and/or a deterioration in local access (Bischof and Kaiser, 2021). Moreover, most of the previous work does not explicitly differentiate between short-run and long-run effects. However, this distinction is crucial when assessing the relative importance of each channel: Short-run effects are driven by the disruption in the doctor-patient relationship, whereas persistent effects are likely to be due to differences in practice styles and access-related issues (the latter only applies to closures). Another limitation of the existing literature is that studies for the United States mostly focus on a specific subgroup of the population (patients enrolled in Medicare or Medicaid), thereby limiting the generalizability of the results (Sabety et al., 2021; Piwnica-Worms et al., 2021; Staiger, 2022; Zhang, 2022).

The objective of this study is to examine both the short-run and long-run effects of an exogenous switch in GPs on patients' health care utilization and the associated costs. To do this, we focus on practice handovers, a situation in which a retiring GP sells his practice to a successor. First, this setting allows us to study how patients are affected in the short run when they transfer to a new provider. Second, we analyse whether and how physician practice styles affect patients' utilization, costs and outcomes by estimating long-run effects. The setting of practice handovers is appealing because apart from the change in physicians, all other factors such as access to primary care, travel distance, non-physician staff, health insurance contracts etc. remain unchanged. Therefore, studying handovers allows us to isolate the role of the GP in absence of changes in access that occur when practices are closed down. Understanding the consequences of GP exits is important from the perspective of health policy and planning, given that increasingly many GPs will retire in the forthcoming years in many developed countries (OECD, 2021).

2 Materials and Methods

2.1 Institutional Setting

In Switzerland, 90% of residents report to have a regular source of primary care, which is usually a private GP practice (Merçay, 2016). Swiss GPs are typically self-employed, and work in solo or shared practices (Senn et al., 2016). The patient is responsible to enroll with a GP and to transfer to a new GP if required. Depending on the mandatory health insurance plan, patients either enjoy direct access to all licensed physicians including specialists (standard plan) or they must visit their regular GP first (managed care plan; preferred provider (PPO), health maintenance organization (HMO), and telemedicine). The costs for primary care are covered by mandatory health insurance, although patients bear some of the costs through deductibles and co-payments. We refer to previous work for a thorough overview of the institutional setting (Bischof and Kaiser, 2021).

2.2 Sources of Data

We use detailed data from mandatory health insurance claims provided by a large Swiss health insurer. The data covers the period 2005 to 2018 and includes only individuals who were continuously insured for a period of at least six years. For each individual, we observe basic demographics, the region of residence and health plan characteristics. Claim records include information on the provider, the number of visits, costs, and information on individual services. The data are aggregated to a matched patient-provider-year panel dataset containing annual health care utilization and costs. Information on the occurrence of handovers of GP practices in Switzerland was gathered in a primary data collection, building on previous work Bischof and Kaiser (2021). We first analysed existing provider-level register data to match exiting GPs with entering GPs. In a second step, we conducted extensive field research, to identify practice handovers among other possible events (see Appendix A for more information). In total, we identified 652 exiting GPs who handed over their practice to a successor between 2007 and 2015 ("treated" GPs), while there were 3,236 GP practices that were active during the entire observation period ("control" GPs). Most exits are due to retirements given the age structure of the GPs (see Figure B.3.I in Appendix B).

2.3 Study Design

2.3.1 Treatment and Control Group

Patients are included in the main sample if they live in Switzerland, are at least 18 years old at the beginning of the observation period and still alive at the end of the observation period. For the construction of treatment and control group we closely follow the procedure in previous work Bischof and Kaiser (2021). We define the "treated" group as those patients who experience a change in their regular GP caused by a practice handover. Since patients' regular GP must be determined empirically, we match patients to GPs based on the observed distribution of doctor visits. First, we consider all patients who visited any exiting GP at least once in the two years preceding the event. Second, we assign patients to the treatment group only if the majority (i.e., at least 50%) of their primary care visits were made to the exiting GP. The control group should consist of patients who do not experience any exit of their regular GP, but who are otherwise similar. For this reason, we first assign a hypothetical event year to each control GP ("pseudo handover"). To do this, we generate random draws from the distribution of event years (i.e., years when the handovers took place) in the treatment group. Second, we assign patients to the control group based on the same sampling procedure used for the treated group. This ensures that the data are well balanced in terms of calendar year. Our main sample consists of 241,429 patients, whereof 43,767 experience a practice handover (treated group) and 197,662 do not (control group).

2.3.2 Empirical Strategy

Our setting consists of a difference-in-differences (DiD) framework in which we compare health care utilization between the treated and the control group before and after a practice handover takes place. Since the initial year of treatment varies across individuals, our framework is referred to as a staggered adoption design. For this design, the recent econometric literature shows that standard fixed-effects models pooling all treatment cohorts do not recover meaningful estimates of causal effects (Sun and Abraham, 2021; Callaway and Sant'Anna, 2021; Goodman-Bacon, 2021; Borusyak et al., 2021). Simply speaking, the main reason is that early-treated cohorts contaminate the counterfactual time trend of the later-treated cohorts. To avoid this problem, we first estimate a fixed-effects model separately for each cohort, where a cohort is defined by their initial year of (pseudo-) treatment. We refer to Appendix A for a more detailed explanation of the estimation procedure.

The central identifying assumption in the DiD design is that trends in the dependent variable between the treated and control group would have been parallel in the absence of the treatment. To increase the credibility of this assumption and to ensure balance between groups, we enhance the fixed-effects regression with balancing weights (Cefalu et al., 2020). We estimate these weights separately for each cohort using the entropy balancing method (see Appendix A) Hainmueller (2012).

2.4 Variables

The claims data allows us to construct a range of dependent variables on the patient-year level. First, we use the number of ambulatory visits made to GP practices, specialists and outpatient departments of hospitals as well as the total number of specialist and ambulatory providers visited. For health-related outcomes, we generate an indicator for having any hospitalization and the number of days spent in inpatient care. We also consider several measures of health care costs: overall costs, ambulatory costs, costs per visit, prescription drug costs and laboratory costs. Furthermore, we focus on a variety of services that are often considered to be potentially of low value in primary care: spine imaging, lipid measurements for elderly patients, MRI of the knee, prostate specific antigen (PSA) tests, and vitamin D tests Will et al. (2018); Armitage et al. (2019); Bunt et al. (2018); US Preventive Services Task Force (2018); LeFevre (2015). Finally, we look at four frequent chronic conditions: reflux disease, high cholesterol and hypertension, depression and anxiety, and type 2 diabetes. Since data on diagnoses is absent, chronic conditions are proxied by pharmaceutical cost groups (PCGs).

For the estimation of balancing weights, we include a rich set of covariates: age, gender, nationality, language of correspondence, region of residence (NUTS-2 level), local physician density, deductible level (high, medium, low), health plan (standard plan, preferred provider, HMO, telemedicine), accident coverage, indicators for 24 pharmaceutical cost groups (PCGs) and a measure of continuity of care with the regular GP in the pre-treatment period. Moreover, we include lagged dependent variables taken from several pre-treatment periods. To keep the specification concise, we use two-year averages for up to four years prior to the event. A detailed description of all variables can be found in Appendix A.

Table 1: Descriptive Statistics, Pre-Treatment Period

	Treated		Controls		
	Mean	SD	Mean	SD	Std. Diff.
Ambulatory utilization					
Total visits	9.36	9.64	9.35	10.1	-0.001
GP visits	5.21	5.74	5.22	6.15	0.002
Specialist visits	2.69	4.76	2.68	4.98	-0.003
Hospital outpatient visits	1.46	3.48	1.45	3.48	-0.004
Number of providers	1.30	2.32	1.29	2.34	-0.003
Number of specialist providers	1.12	1.32	1.12	1.33	-0.002
Usual provider continuity index	0.93	0.12	0.93	0.12	0.002
Inpatient utilization					
Hospitalization	12.2%		12.1%		-0.004
Number of inpatient days	1.82	9.45	1.85	9.95	0.003
Costs (in CHF)					
Total costs	3,962	7,651	3,948	7,660	-0.002
Ambulatory costs	1,817	2,684	1,808	2,669	-0.003
Costs per visit	127	153	127	143	-0.006
Prescription drug costs	1,061	4,087	1,054	3,857	-0.002
Laboratory costs	103	204	100	205	-0.011
Demographics					
Age	56.4	14.8	56.4	15.0	-0.004
Female	54.3%		54.3%		0.001
Swiss nationality	84.1%		84.1%		0.000
German language	79.0%		78.9%		-0.001
Health plan					
Medium deductible	22.4%		22.5%		0.003
High deductible	19.3%		19.1%		-0.004
Preferred provider plan	29.8%		29.4%		-0.010
HMO plan	4.2%		4.0%		-0.007
Telemedicine plan	0.9%		0.9%		0.000
Regional information					
Lake Geneva	11.9%		11.9%		0.001
Central Switzerland	28.4%		28.2%		-0.004
Espace Mitteland	19.1%		19.4%		0.008
Northwestern Switzerland	11.8%		11.6%		-0.008
Eastern Switzerland	14.6%		14.6%		-0.001
Ticino	1.8%		1.8%		0.001
Local physician density	0.76	0.33	0.76	1.15	0.000
PCGs (selection)					
Reflux diseases	13.7%		13.6%		-0.003
Type 2 diabetes	5.9%		5.9%		0.000
high cholesterol and hypertension	10.6%		10.6%		-0.002
Depression and anxiety	9.7%		9.7%		0.001
Number of GP practices	652		3,236		
Number of patients	43,767		197,662		
Number of observations	603,806		2,718,039		

Notes: The numbers are measured in annual terms based on the calendar year prior to the (pseudo-) handover. The control group is weighted using entropy balancing weights. The standardized difference is the difference in sample means divided by the square root of the average of the two sample variances. Abbreviations: GP, general practitioner, HMO, health maintenance organization, PCG, pharmaceutical cost group, SD, standard deviation, Std. Diff., standardized difference.

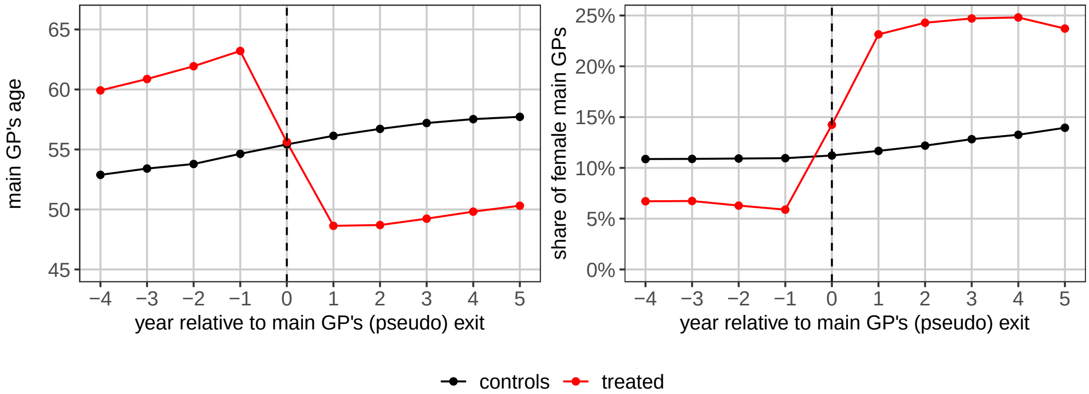
3 Results

3.1 Descriptive Statistics

Descriptive statistics for the treated and control groups of patients from the year prior to the (pseudo-) handover are shown in Table 1. The statistics for the control group are weighted using the balancing weights. Utilization patterns show that more than half of all ambulatory visits are made to GPs. About 12% of patients are hospitalized at least once. Total annual costs in mandatory health insurance are roughly CHF 4,000 per patient, of which almost half are generated in an ambulatory setting. Demographics suggest that our sample of patients is on average somewhat older, more likely to be female and more likely to be German-speaking compared to the overall adult population of Switzerland Bischof and Kaiser (2021). Comparing the means across the two groups, we note that the balancing weights ensure that average characteristics are nearly identical. This is also reflected in the standardized difference, which is indeed very small for all of the covariates (rightmost column). The standardized difference is an adequate measure to assess the degree of imbalances in the covariates across treatment groups because it does not depend on the sample size (Imbens and Wooldridge, 2009). For the sake of brevity, Table 1 only contains a small selection of the available PCGs, the full list is found in Table B.2.I in Appendix B. For completeness, descriptive statistics without using balancing weights can be found in Table B.2.II in Appendix B.

Figure 1 displays average characteristics of patients' main GP over time and across groups. If patients visit several GPs in a given year, the main GP is the one to whom most visits are attributed. The figure illustrates that the transition from a retiring to a new GP in the treated group is associated with a sharp and persistent change in physician demographics. The average physician age decreases from roughly 64 years in $t = -1$ to 49 years in $t = 1$. In contrast, the main GP's average age gradually and smoothly increases over time in the control group. As younger GPs are more likely to be female, it is not surprising that we observe a sharp increase in the share of female physicians following the handover Cohidon et al. (2015). Around 25% of the main GPs in the post-treatment period are women, compared to only 5% of the exiting GPs before the handover. Taken together, Figure 1 demonstrates that the transfer to a new regular GP is accompanied with a substantial change in average physician demographics and thus, in turn, with changes in physician practice styles that are associated with these demographics.

Figure 1: GP characteristics over time



Notes: This figure shows entropy balancing weighted averages by treatment group over time. Here, the main GP is assigned to patients annually based on observed GP visits. If a patient has no GP visits in a given year, the last known value is carried forward. Patients with missing information on main GP characteristics are excluded (treated=11%, controls=12%).

3.2 Difference-in-Differences Estimates

Conceptually, we might expect two different effects from a switch in the regular GP on patients' utilization and costs. First, in the short run, the disruption in the continuity of care may trigger a change in health care utilization due to the initial re-assessment of a patient's health care needs. In doing so, the new GP may initiate additional diagnostic measures, for example, by referring patients to specialists or hospitals or by conducting blood tests. Indeed, two recent studies find that the new physician might diagnose conditions that had gone unnoticed by his predecessor Simonsen et al. (2021); Zhang (2022). Second, in the longer run, the effects of the interpersonal discontinuity of care are expected to vanish, once the new GP has learned about his patients' health status and health behaviors. However, differences in utilization and outcomes before and after the practice handover may still persist because the entering GPs exert different practice styles compared to the retiring GPs. To investigate these two channels, we report short-run effects calculated in the first year after the handover ($t = 1$) as well as long-run effects calculated in the fifth year after the handover ($t = 5$).

Table 2 reports the estimated causal effects, the treatment effect on the treated (ATT), of practice handovers on a wide range of dependent variables. Since the dependent variables are measured on different scales, we focus on the relative effect which is computed by dividing the absolute effect by the average counterfactual mean in the treated group. To assess the validity of the estimation strategy, Figure B.1.I in Appendix B shows that there are no discernible pre-trends in the estimated effects for a selected number of utilization and cost measures.

3.2.1 Utilization and Costs

Panel A in Table 2 shows the average effects of a practice handover on patients' utilization patterns. In the short run, a practice handover leads to a transitory increase in total visits of 2.6%, essentially no change in GP visits, and significantly more specialist and hospital outpatient visits. Furthermore, we observe a short-term increase in the number of providers which is partly driven by the switch to a new GP and a rise in the number of specialist providers. Considering the long-run effects, we see that the effect on total visits, hospital outpatient visits and the number of providers is only transitory, as the effects are smaller and insignificant in the long run. A different pattern emerges when comparing GP visits to specialist visits. While the number of GP visits significantly decreases in the long run (-3.7%), the positive effects on specialist visits and the number of specialist providers amount to 3.7% and 5.4%, respectively. These findings indicate that there is a persistent shift from primary to specialist care following the handover.

We do not find any evidence for adverse health effects as measured by the hospitalization rate and the number of days spent in hospitals. The estimated impacts are small in magnitude and statistically insignificant (see Panel B of Table 2).

Panel C of Table 2 presents the causal short-run and long-run effects on various cost categories. In the short run, we observe an increase in overall costs of 3.3%, mainly driven by higher ambulatory costs. The reason for this is twofold: First, there is an increase in doctor visits, and second, visits become more expensive on average (2.7%). Possible reasons for the - persistently - higher costs per visit are that consultation time increases and/or more expensive treatments are administered. The latter may be associated with specialist visits, which generally entail more costly health care services. We also note that the largest effect (in relative terms) concerns laboratory costs, amounting to 18.5% in the short run.

The transitory short-run effects on the number of visits and total costs suggest that entering GPs initially use more resources because they conduct a re-assessment of their patients' medical needs, for example, by having longer consultations or running more diagnostic tests such as blood tests. After five years, some effects still persist, however. In particular, we observe a shift from primary to secondary care, more expensive visits and higher laboratory costs. Most likely, these long-run effects are associated with differences in physician practice styles between exiting and entering GPs. In light of Figure 1, this explanation is plausible because entering GPs, on average, are less experienced, younger and are more often female compared to their retiring counterparts.

Table 2: Effects on Utilization, Hospitalization, Costs and Prevalence Chronic Condition

	short-run (t = 1)			long-run (t = 5)		
	ATT	SE	Baseline	ATT	SE	Baseline
A. Utilization						
Total visits	2.6%**	(0.009)	9.78	-0.7%	(0.010)	10.28
GP visits	0.5%	(0.013)	5.01	-3.7%*	(0.017)	4.94
Specialist visits	5.4%**	(0.012)	3.08	3.7%**	(0.014)	3.35
Hospital outpatient visits	4.1%**	(0.016)	1.68	1.6%	(0.019)	1.93
Number of providers	7.2%**	(0.013)	1.48	2.2%	(0.015)	1.61
Number of specialist providers	6.3%**	(0.008)	1.27	5.4%**	(0.010)	1.39
B. Hospitalization						
Hospitalization	1.8%	(0.020)	0.13	0.0%	(0.020)	0.14
Number of inpatient days	0.2%	(0.035)	1.95	1.6%	(0.038)	2.33
C. Costs						
Total costs	3.3%**	(0.011)	4,629	2.1%	(0.012)	5,693
Ambulatory costs	6.2%**	(0.011)	2,142	3.0%*	(0.012)	2,461
Costs per visit	2.7%**	(0.009)	138.1	3.2%**	(0.011)	151.6
Prescription drug costs	2.7%	(0.014)	1,207	2.8%	(0.019)	1,423
Laboratory costs	18.5%**	(0.029)	234.6	8.1%**	(0.025)	250.3
D. Costs potentially low-value care						
Spine imaging costs[a]	6.8%	(0.057)	22.99	11.7%*	(0.058)	25.41
Lipid measurement costs[b]	36.8%**	(0.077)	4.27	26.3%**	(0.084)	3.78
Knee MRI costs[a]	-8.7%	(0.093)	5.19	11.5%	(0.102)	5.62
PSA test costs	12.5%**	(0.048)	2.63	7.2%	(0.049)	2.74
Vitamin D test costs	33.3%**	(0.083)	12.81	12.5%*	(0.057)	15.37
E. Prevalence of chronic conditions (PCGs)						
Reflux disease	4.1%**	(0.010)	0.17	2.9%*	(0.014)	0.21
High cholesterol and hypertension	10.0%**	(0.014)	0.13	10.3%**	(0.020)	0.15
Depression and anxiety	-2.4%*	(0.011)	0.10	-4.6%**	(0.017)	0.11
Type 2 diabetes	4.7%**	(0.012)	0.07	3.6%*	(0.016)	0.09

Notes: This table shows weighted short-run and long-run estimates of causal effects of practice handovers on outcomes in relative terms, that is, the aggregated coefficients of the interaction between the treatment group and time period t+1 and t+5. The model includes patient fixed effects and time effects. Data is measured in annual terms. Standard errors are clustered at the physician level. Estimates of panel D. and laboratory costs are based on cohorts 2012-2015, due to limited data availability for earlier cohorts. Long-run estimates for these outcomes correspond to those in time period t+3. $^{*}p < 0.05$, $^{**}p < 0.01$. Abbreviations: ATT, average treatment effect on the treated, GP, general pracitioner, MRI, magnetic resonance imaging, PCG, pharmaceutical cost group, PSA, prostate specific antigen, SE, standard error. [a] treatment due to illness, [b] patient age ≥ 75.

3.2.2 Potentially Low-Value Care

Given the evidence discussed above, an obvious follow-up question is whether the rise in costs and utilization is in fact beneficial for patients' health or whether it merely represents an increase in resource use. We tackle this question by focusing on a selected number of specific services that are often considered to be potentially of low value in a primary care setting. These include spine imaging (excluding accidents), lipid measurements with elderly patients, MRI of the knee (excluding accidents), PSA tests and vitamin D tests Will et al. (2018);

Armitage et al. (2019); Bunt et al. (2018); US Preventive Services Task Force (2018); LeFevre (2015). The corresponding results are depicted in Panel D of Table 2. We find large and significant increases in costs for lipid measurements (36.8%), PSA tests (12.5%) and vitamin D tests (33.3%) in the short run. The effects tend to fade out in the long run. Overall, our results provide some suggestive evidence for an increased use of potentially low-value care, but absent data on health outcomes, it is difficult to draw strong conclusions.

3.2.3 Chronic Conditions and Prescription Drug Use (PCGs)

In a next step, we analyse whether practice handovers affect the prevalence of four common chronic conditions as proxied by PCGs. The results are shown in Panel E of Table 2. The most pronounced and persistent effect can be observed for high cholesterol and hypertension, where the prevalence persistently increases by around 10%. The prevalence of the PCGs for reflux disease and type 2 diabetes also increase, albeit to a lesser extent. In contrast, the prevalence of the PCG for depression and anxiety significantly decreases both in the short and long run. As the prevalence of chronic conditions is measured by prescription drug use, we consider two potential explanations. First, as new GPs reassess patients' health status after taking over the cases, they may diagnose chronic conditions that had previously gone unnoticed, and consequently, start administering new pharmaceutical treatments. Second, the findings may also reflect differences in practice styles with regard to prescription drug use. The new GPs may be more or less inclined to prescribe certain drugs compared to their predecessors. For example, entering GPs may be more hesitant to prescribe antidepressants or tranquilizers, and in contrast, may prefer alternative treatments (such as psychotherapist counseling in this case). These changes are most likely associated with a re-assessment of patients' health status and, in addition, may be linked to physicians' preferences towards drug-related treatments.

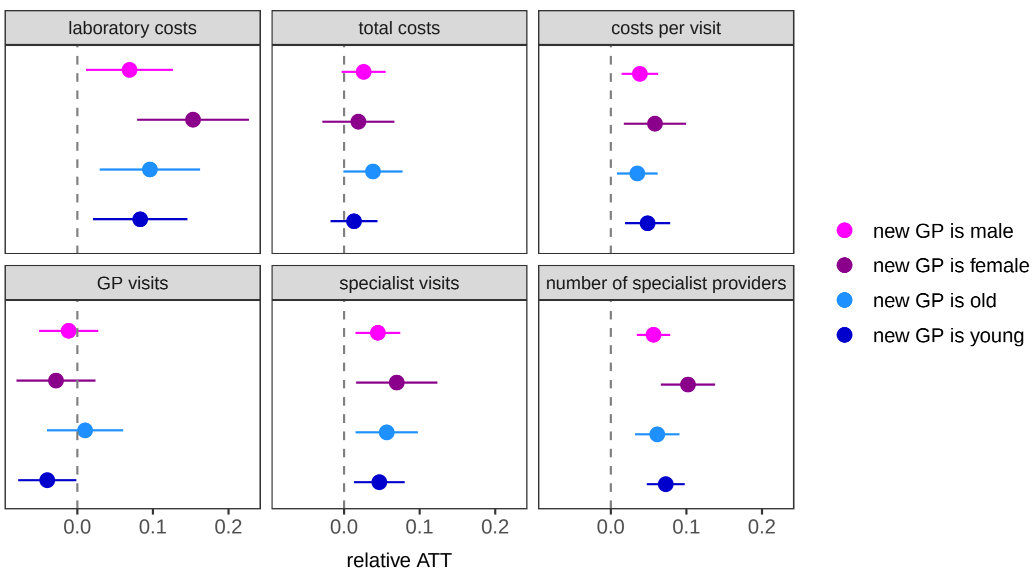
3.3 Heterogeneity analysis

To investigate the role of physician practice styles further, we test whether the estimated effects are heterogeneous across different GP characteristics. Previous studies report that practice styles differ considerably with respect to physician age and gender Currie et al. (2016); Hedden et al. (2014); Kaiser (2017). It is therefore interesting to examine whether the effects depend on age and gender of the entering GP. To categorize by physician age, we split the treated group at the median age of the entering GP (46 years) in $t = 1$. To categorize by physician gender, we simply split the treated group according to their main GP's gender in

$t = 1$.

Figure 2 shows the results for selected utilization measures across different GP characteristics. Consistent with previous studies, switching to a female GP leads to higher laboratory costs compared to a male GP, which suggests that female doctors run more diagnostic tests such as blood tests Kaiser (2017); Hedden et al. (2014). Female doctors have somewhat longer (but fewer) consultations, as indicated by higher costs per visit. They also refer patients more frequently to specialists compared to their male colleagues. Overall, there is some evidence for gender-specific practice styles among GPs that is in line with other existing studies Kaiser (2017); Hedden et al. (2014). Comparing entering GPs by age, the estimates indicate that younger GPs have fewer consultations with their patients than older GPs, which may explain the smaller effect on total health care costs. For the other utilization measures considered, the effect heterogeneity across GPs' age seems less pronounced. It is worth noting that handovers lead to significantly more specialist visits and a larger number of specialist providers visited in all subgroups. Overall, these results are consistent with findings from previous studies which report variation in practice styles due to differences in physician demographics Choudhry et al. (2005); Hedden et al. (2014); Kaiser (2017).

Figure 2: Long-term effects by physician demographics



Notes: This figure shows estimates of long-term causal effects of practice handovers on utilization and costs. We report the relative average treatment effect on the treated (ATT) because dependent variables are measured on different scales. The dots represent the point estimates and the horizontal lines depict the corresponding 95% confidence interval.

4 Discussion

Our results show that a practice handover leads to a transitory rise in the total number of visits and total health care costs. In the long run, we document a significant and persistent increase in specialist health care utilization, ambulatory costs, laboratory costs and costs per visit. The former finding suggests that the interpersonal discontinuity has some temporary effect, but more importantly, the latter finding implies that physician practice styles also have an impact on the delivery of health care. This notion is supported by the fact that patients affected by a handover experience a substantial change in average physician demographics, i.e., the entering GP is more likely to be female and on average much younger than their predecessor. Recent studies indeed report that female GPs tend to have fewer but longer visits, solve more problems in one consultation and are more likely to refer patients to specialists Hedden et al. (2014). Female GPs are also found to perform more laboratory tests, but prescribe fewer drugs compared to their male counterparts Kaiser (2017). This implies more expensive GP visits as well as more specialist visits, which is consistent with our results.

Besides utilization and costs, we also document that a practice handover leads to changes in the prevalence of certain chronic conditions measured by PCGs. In the case of reflux disease, type 2 diabetes, high cholesterol and hypertension, the increase could be a consequence of a re-assessment of patients' health status. Entering GPs administer drug treatments for chronic conditions that were untreated or undetected by their predecessors. Indeed, these results are consistent with findings for practice closures in Denmark and GP exits in the US (Simonsen et al., 2021; Zhang, 2022). Another explanation is that entering GPs may have different practice styles with respect to diagnostic intensity (Song et al., 2010; Gowrisankaran et al., forthcoming), and/or prescription drug use. In the case of depression and anxiety, entering GPs may de-prescribe certain medication and place more emphasis on psychotherapist counseling instead. This presumption is supported by a recent study reporting a positive association between years of practical experience and over-prescription of antidepressants (Hengartner et al., 2021).

In contrast to the literature on interpersonal continuity of care (Cheng et al., 2010; Hansen et al., 2013; Nyweide et al., 2013), we do not find any evidence that discontinuities of care lead to adverse health effects, to the extent that this can be measured by hospitalizations and the number of days spent in inpatient care. Since our empirical design allows for causal conclusions under plausible assumptions, disruptions in the doctor-patient relationship may not be as important for patient health as this literature suggests given that access to care is preserved.

A limitation of our study is that the claims data does not contain any information on diagnoses, e.g. ICD-10 codes. While PCGs are informative on the prevalence of certain chronic conditions, they also reflect physicians' prescribing behavior to some extent. Data on diagnoses could shed some light on the question as to whether the increase in health care utilization is due to newly detected chronic conditions, which warrants more health care and higher costs, or due to inefficiencies in the delivery of health care. Another limitation is that claims data contain only limited and indirect information on patient health. Our results suggest that changing GP does not lead to more hospitalizations, but patient health could also be affected in different ways that we fail to capture with our data.

5 Conclusions

Our findings also provide important insights with regard to previous work that focuses on closures of GP practices. Practice closures simultaneously affect access to care, continuity of care and physician practice styles such that it is hard to assess the relative importance of each of these channels. A recent study finds that practice closures lead to a decrease in overall doctor visits and a sharp drop in GP visits, which are particularly pronounced in areas with low physician density (Bischof and Kaiser, 2021). In contrast, in the present study, access to care remains unchanged and we do not observe any significant negative effects on overall health care utilization. We therefore conclude that deteriorating access to a primary care provider is the main explanation of the drop in utilization observed after practice closures. Moreover, previous studies show that practice closures lead to shifts towards more specialist care and hospital outpatient care (Bischof and Kaiser, 2021; Sabety et al., 2021). We also find these types of substitution effects in the case of practice handovers where access to care does not change. This suggests that physician practice styles at least partially explain the observed shifts towards specialists and hospitals in the case of closures.

From a policy perspective, our findings carry certain lessons in the face of the increasing number of retiring GPs in the forthcoming years. While practice closures have adverse effects on health care utilization, especially in peripheral areas, practice handovers do not affect overall utilization rates. In other words, smooth transitions from an exiting GP to a new GP help to ensure continuous access to primary care, which is crucial from the patient perspective. One policy recommendation could be to actively assist patients in transferring to a new GP when their previous GP retires.

Bibliography

Agha, Leila, Brigham Frandsen, and James B. Rebitzer, "Fragmented division of labor and healthcare costs: Evidence from moves across regions," *J Public Econ*, January 2019, *169*, 144–159.

Armitage, Jane, Colin Baigent, Elizabeth Barnes, D. John Betteridge, Lisa Blackwell, Michael Blazing, Louise Bowman, Eugene Braunwald, Robert Byington, Christopher Cannon, Michael Clearfield, Helen Colhoun, Rory Collins, Björn Dahlöf, Kelly Davies, Barry Davis, James de Lemos, John R. Downs, Paul Durrington, Jonathan Emberson, Bengt Fellström, Marcus Flather, Ian Ford, Maria Grazia Franzosi, Jordan Fulcher, John Fuller, Curt Furberg, David Gordon, Shinya Goto, Antonio Gotto, Heather Halls, Charlie Harper, C. Morton Hawkins, Will Herrington, Graham Hitman, Hallvard Holdaas, Lisa Holland, Alan Jardine, J. Wouter Jukema, John Kastelein, Sharon Kean, Anthony Keech, Adrienne Kirby, John Kjekshus, Genell Knatterud (deceased), Robert Knopp (deceased), Wolfgang Koenig, Michael Koren, Vera Krane, Martin J. Landray, John LaRosa, Eva Lonn, Peter MacFarlane, Stephen MacMahon, Aldo Maggioni, Roberto Marchioli, Ian Marschner, Borislava Mihaylova, Lemuel Moyé, Sabina Murphy, Haruo Nakamura, Andrew Neil, Connie Newman, Rachel O'Connell, Chris Packard, Sarah Parish, Terje Pedersen, Richard Peto, Marc Pfeffer, Neil Poulter, David Preiss, Christina Reith, Paul Ridker, Michele Robertson, Frank Sacks, Naveed Sattar, Roland Schmieder, Patrick Serruys, Peter Sever, John Shaw, Charles Shear, John Simes, Peter Sleight, Enti Spata, Luigi Tavazzi, Jonathan Tobert, Gianni Tognoni, Andrew Tonkin, Stella Trompet, John Varigos, Christoph Wanner, Hans Wedel, Harvey White, John Wikstrand, Lars Wilhelmsen, Kate Wilson, Robin Young, Salim Yusuf, and Faiez Zannad, "Efficacy and safety of statin therapy in older people: a meta-analysis of individual participant data from 28 randomised controlled trials," *The Lancet*, February 2019, *393* (10170), 407–415.

Bischof, Tamara and Boris Kaiser, "Who cares when you close down? The effects of primary care practice closures on patients," *Health Econ*, 2021, *30* (9), 2004–2025.

Borusyak, Kirill, Xavier Jaravel, and Jann Spiess, "Revisiting event study designs: Robust and efficient estimation," 2021. arXiv preprint arXiv:2108.12419.

Bunt, Christopher W., Christopher E. Jonas, and Jennifer G. Chang, "Knee Pain in Adults and Adolescents: The Initial Evaluation," *Am Fam Physician*, November 2018, *98* (9), 576–

585.

Callaway, Brantly and Pedro HC Sant'Anna, "Difference-in-differences with multiple time periods," *J Econom*, 2021, *225* (2), 200–230.

Cebul, Randall D., James B. Rebitzer, Lowell J. Taylor, and Mark E. Votruba, "Organizational Fragmentation and Care Quality in the U.S. Healthcare System," *J Econ Perspect*, December 2008, *22* (4), 93–113.

Cefalu, Matthew, Brian G Vegetabile, Michael Dworsky, Christine Eibner, and Federico Girosi, "Reducing bias in difference-in-differences models using entropy balancing," 2020. arXiv preprint arXiv:2011.04826.

Cheng, Shou-Hsia, Chi-Chen Chen, and Yen-Fei Hou, "A longitudinal examination of continuity of care and avoidable hospitalization: evidence from a universal coverage health care system," *Arch Intern Med*, 2010, *170* (18), 1671–1677.

Choudhry, Niteesh K., Robert H. Fletcher, and Stephen B. Soumerai, "Systematic Review: The Relationship between Clinical Experience and Quality of Health Care," *Ann Intern Med*, February 2005, *142* (4), 260–273.

Cohidon, Christine, Jacques Cornuz, and Nicolas Senn, "Primary care in Switzerland: evolution of physicians' profile and activities in twenty years (1993–2012)," *BMC Fam Pract*, 2015, *16* (1), 1–9.

Currie, Janet, W. Bentley MacLeod, and Jessica Van Parys, "Provider practice style and patient health outcomes: The case of heart attacks," *J Health Econ*, May 2016, *47*, 64–80.

Fadlon, Itzik and Jessica Van Parys, "Primary care physician practice styles and patient care: Evidence from physician exits in Medicare," *J Health Econ*, May 2020, *71*, 102304.

Frandsen, Brigham R., Karen E. Joynt, James B. Rebitzer, and Ashish K. Jha, "Care fragmentation, quality, and costs among chronically ill patients," *Am J Manag Care*, May 2015, *21* (5), 355–362.

Freeman, George K, Frede Olesen, and Per Hjortdahl, "Continuity of care: an essential element of modern general practice?," *Fam Pract*, 2003, *20* (6), 623–627.

Goodman-Bacon, Andrew, "Difference-in-differences with variation in treatment timing," *J Econom*, 2021, *225* (2), 254–277.

Gowrisankaran, Gautam, Keith Joiner, and Pierre Thomas Léger, "Physician Practice Style and Healthcare Costs: Evidence from Emergency Departments," *Manage Sci*, October forthcoming.

Haggerty, Jeannie L., Robert J. Reid, George K. Freeman, Barbara H. Starfield, Carol E. Adair, and Rachael McKendry, "Continuity of care: a multidisciplinary review," *BMJ*, November 2003, *327* (7425), 1219–1221.

Hainmueller, Jens, "Entropy balancing for causal effects: A multivariate reweighting method to produce balanced samples in observational studies," *Polit Anal*, 2012, *20* (1), 25–46.

Hansen, Anne Helen, Peder A Halvorsen, Ivar J Aaraas, and Olav Helge Førde, "Continuity of GP care is related to reduced specialist healthcare use: a cross-sectional survey," *Br J Gen Pract*, 2013, *63* (612), e482–e489.

Hedden, Lindsay, Morris L Barer, Karen Cardiff, Kimberlyn M McGrail, Michael R Law, and Ivy L Bourgeault, "The implications of the feminization of the primary care physician workforce on service supply: a systematic review," *Hum Resour Health*, 2014, *12* (1), 1–11.

Hengartner, Michael P., Stefan Neuner-Jehle, and Oliver Senn, "Swiss GPs' preferences for antidepressant treatment in mild depression: vignette-based quantitative analysis," *BMC Fam Pract*, December 2021, *22* (1), 261.

Imbens, Guido W and Jeffrey M Wooldridge, "Recent developments in the econometrics of program evaluation," *J Econ Lit*, 2009, *47* (1), 5–86.

Kaiser, Boris, "Gender-specific practice styles and ambulatory health care expenditures," *Eur J Health Econ*, December 2017, *18* (9), 1157–1179.

Kwok, Jennifer, "How Do Primary Care Physicians Influence Healthcare? Evidence on Practice Styles and Switching Costs from Medicare," July 2019. SSRN preprint.

LeFevre, Michael L., "Screening for Vitamin D Deficiency in Adults: U.S. Preventive Services Task Force Recommendation Statement," *Ann Intern Med*, January 2015, *162* (2), 133–140.

Leleu, Henri and Etienne Minvielle, "Relationship between longitudinal continuity of primary care and likelihood of death: analysis of national insurance data," *PLoS One*, 2013, *8* (8), e71669.

Merçay, Clémence, "Expérience de la population âgée de 18 ans et plus avec le système de santé–Situation en Suisse et comparaison internationale. Analyse de l'International Health

Policy Survey 2016 du Commonwealth Fund sur mandat de l'Office fédéral de la santé publique (OFSP)," Obsan Dossier 56, Swiss Health Observatory (OBSAN) 2016.

Nyweide, David J, Denise L Anthony, Julie PW Bynum, Robert L Strawderman, William B Weeks, Lawrence P Casalino, and Elliott S Fisher, "Continuity of care and the risk of preventable hospitalization in older adults," *JAMA Intern Med*, 2013, *173* (20), 1879–1885.

OECD, *Health at a Glance 2021: OECD Indicators*, Paris: OECD Publishing, November 2021.

Piwnica-Worms, Katherine, Becky Staiger, Joseph S. Ross, Marjorie S. Rosenthal, and Chima D. Ndumele, "Effects of forced disruption in Medicaid managed care on children with asthma," *Health Serv Res*, 2021, *56* (4), 668–676.

Sabety, Adrienne H, Anupam B Jena, and Michael L Barnett, "Changes in health care use and outcomes after turnover in primary care," *JAMA Intern Med*, 2021, *181* (2), 186–194.

Saultz, John W and Jennifer Lochner, "Interpersonal continuity of care and care outcomes: a critical review," *Ann Fam Med*, 2005, *3* (2), 159–166.

Scott, Anthony, "Economics of general practice," in Anthony J. Culyer and Joseph P. Newhouse, eds., *Handbook of Health Economics*, Vol. 1B, Amsterdam: Elsevier, January 2000, pp. 1175–1200.

Senn, Nicolas, Sonja Tiaré Ebert, and Christine Cohidon, "La médecine de famille en Suisse. Analyse et perspectives sur la base des indicateurs du programme SPAM (Swiss Primary Care Active Monitoring)," Obsan Dossier 55, Swiss Health Observatory (OBSAN) 2016.

Simonsen, Marianne, Lars Skipper, Niels Skipper, and Peter Rønø Thingholm, "Discontinuity in care: Practice closures among primary care providers and patient health care utilization," *J Health Econ*, 2021, *80*, 102551.

Song, Yunjie, Jonathan Skinner, Julie Bynum, Jason Sutherland, John E. Wennberg, and Elliott S. Fisher, "Regional Variations in Diagnostic Practices," *N Engl J Med*, July 2010, *363* (1), 45–53.

Staiger, Becky, "Disruptions to the Patient-Provider Relationship and Patient Utilization and Outcomes: Evidence from Medicaid Managed Care," *J Health Econ*, January 2022, *81*, 102574.

Sun, Liyang and Sarah Abraham, "Estimating dynamic treatment effects in event studies with heterogeneous treatment effects," *J Econom*, 2021, *225* (2), 175–199.

US Preventive Services Task Force, "Screening for Prostate Cancer: US Preventive Services Task Force Recommendation Statement," *JAMA*, May 2018, *319* (18), 1901–1913.

Walraven, Carl Van, Natalie Oake, Alison Jennings, and Alan J Forster, "The association between continuity of care and outcomes: a systematic and critical review," *J Eval Clin Pract*, 2010, *16* (5), 947–956.

Will, Joshua Scott, David C. Bury, and John A. Miller, "Mechanical Low Back Pain," *Am Fam Physician*, October 2018, *98* (7), 421–428.

Wolinsky, Fredric D, Suzanne E Bentler, Li Liu, John F Geweke, Elizabeth A Cook, Maksym Obrizan, Elizabeth A Chrischilles, Kara B Wright, Michael P Jones, and Gary E Rosenthal, "Continuity of care with a primary care physician and mortality in older adults," *J Gerontol A Biol Sci Med Sci*, 2010, *65* (4), 421–428.

Zhang, Xuan, "The effects of physician retirement on patient outcomes: Anticipation and disruption," *J Pub Econ*, March 2022, *207*, 104603.