University of Basel

Faculty of
Business and Economics

WWZ

May 2024

A Prescription for Knowledge: Patient Information and Generic Substitution

WWZ Working Paper 2024/05

Linn Hjalmarsson, Christian P.R. Schmid, Nicolas Schreiner

A publication of the Center of Business and Economics (WWZ), University of Basel.
© WWZ 2024 and the authors. Reproduction for other purposes than the personal use needs the permission of the author

Universität Basel
Peter Merian-Weg 6
4052 Basel, Switzerland
wwz.unibas.ch

Corresponding Author:
Dr. Nicolas Schreiner
Mail: nicolas.schreiner@unibas.ch

A Prescription for Knowledge: Patient Information and Generic Substitution*

Linn Hjalmarsson† Christian P.R. Schmid‡ Nicolas Schreiner§

May 21, 2024

Abstract

Markets require informed participants to function efficiently. This paper examines the impact of providing targeted information directly to patients on their purchasing-decisions regarding pharmaceutical drugs. We analyze the effect of informational letters sent by a Swiss health insurer to clients who had recently purchased a brand-name drug, informing them of available generic alternatives and potential savings. Utilizing the quasi-randomized timing of the letter dispatch, we employ an event study design with staggered treatment adoption to estimate the causal effect of patient information on generic substitution probability. Based on 540,000 drug purchases by 60,000 patients we find that the probability of switching to a generic alternative increases by almost 30 percentage points immediately after receiving the informational letter, representing nearly a fourfold rise in the substitution likelihood among previous brand-name drug buyers. Furthermore, the effect does not substantially depend on whether patients face a copayment for their drug purchase and thus personally financially benefit from switching. Our results highlight the limits of healthcare policies that rely solely on financial incentives, particularly if patients lack sufficient information in their decision-making.

Keywords: Generic substitution, Pharmaceuticals, Patient information

JEL: D12, D83, D90, I11, I12, I18

*We are grateful to Caroline Chuard, Michael Gerfin, Fabienne Lötscher, Kaspar Wuthrich, Björn Badetscher, Kevin Stadelmann, and seminar participants at the University of Bern, University of Lausanne, the 2023 Winter Meeting of the UK Health Economics Study Group, the SSES Annual Congress 2023, and the 38th Meeting of the European Economic Association for useful feedback.

†CSS Institute and University of Bern, linn.hjalmarsson@css-institut.ch

‡CSS Institute for Empirical Health Economics, christian.schmid@css-institut.ch

§CSS Institute and University of Basel, nicolas.schreiner@css-institut.ch (corresponding author)

Sufficient information for both buyers and sellers is fundamental for markets to function. Despite the unique nature of the health care market — characterized by uncertainty and asymmetric information (Arrow, 1963) — and the generally low levels of consumer knowledge in this sector (see, e.g., Handel and Schwartzstein, 2018), many healthcare systems are nonetheless structured similarly to typical consumer markets. Given the typically significant information asymmetry between medical providers and patients, health policies that aim to steer patients primarily through the price mechanism may thus fail to fully achieve their objectives.

While inefficiencies due to informational frictions are well-documented in health insurance markets (see, e.g., Baicker et al., 2015; Drake et al., 2022; Handel and Kolstad, 2015; Heiss et al., 2021), less attention has been paid to the consequences of patient information in the market for health care itself. The inherent complexity of medical treatments, patients rarely bearing the full costs of their decisions, and government regulations create additional barriers that make acquiring relevant information even more challenging for consumers. Given that patients usually have the final say in healthcare decisions, the greater extent of informational frictions likely has profound consequences.

This paper examines how much providing targeted information directly to patients influences their decision-making. We focus on the straightforward choice in the pharmaceutical market between expensive brand-name drugs and their therapeutically equivalent, low-cost generic counterparts. Given the potential of generic substitution to reduce healthcare expenditures, various policies exist to encourage such switches (see Socha-Dietrich et al., 2017, for an overview). Many of these measures impose additional financial incentives on patients beyond the existing price differences. However, for any market mechanisms to function properly, consumers must first be aware that a choice between multiple products exists.

Our empirical application thus analyzes how responsive patients' purchasing decisions are to receiving targeted information about cheaper alternatives. We study the effect of informational letters sent by a large Swiss health insurer to clients who had recently purchased a brand-name drug. These letters included a list of currently available generic alternatives for the respective brand-name drug and the potential savings from switching to the cheapest option. Although the campaign was not implemented as a randomized controlled experiment, delays due to unrelated marketing correspondences created substantial variation in how soon patients received the letters after buying the branded drug. By exploiting the quasi-randomized timing of the information treatment we avoid potentially misattributing generic switches that occur "organically" with repeated purchases to the letters. Using an event study design with staggered treatment adoption, we compare the not-yet-treated patients with the already treated ones at each purchase "number" of the drug (using the method proposed by Callaway and Sant'Anna, 2021) to estimate the causal effect of patient information on generic substitution probability. Our estimations

are based on a detailed individual-level insurance claims dataset of approximately 540,000 drug purchases of roughly 60,000 patients who received the informational letter.

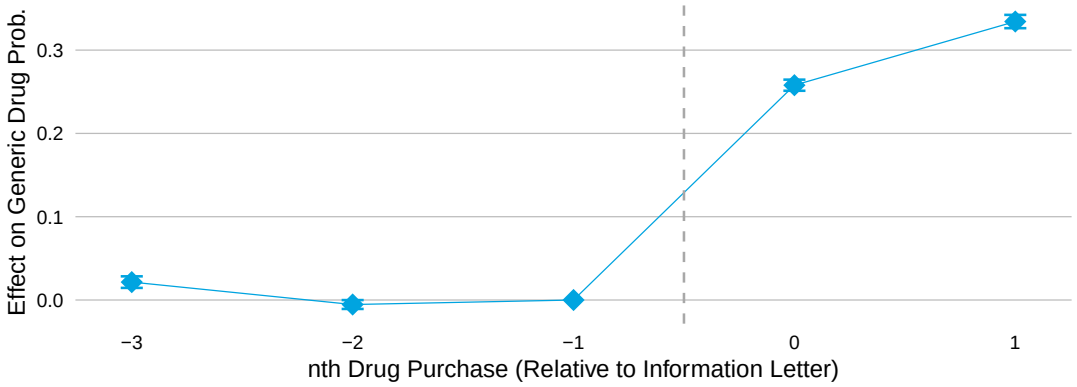


Figure 1: Event Study Estimates for Effect of Information on Generic Substitution

Note: The aggregated difference-in-differences coefficient (average treatment effect on the treated (ATT) of information on generic substitution) is 0.296. The baseline probability of purchasing a generic drug in the three purchases prior to the treatment information letter was 10.2%. Horizontal lines surrounding the coefficients (shown as diamonds) represent the 99% confidence interval of the estimate, with standard errors clustered at the patient level.

Figure 1 presents our main results as event study coefficients before and after receiving the informational letter. Compared to the final purchase prior to the letter, the probability of switching to a generic alternative increases by about 28 percentage points immediately after. Assuming conservatively that only the first two purchases after treatment are directly influenced by the newly provided information, we estimate an overall ATT of 29.6 percentage points. Using the pre-treatment generic share of 10.2%[1] as a baseline, this represents nearly a fourfold increase in the substitution likelihood among previous brand-buyers. Our findings highlight how providing information directly to patients can substantially impact their decisions, aligning them more closely with their actual preferences.

Given the major focus on financial incentives for patient steering in healthcare policies thus far, we also analyze the impact of prices paid by patients once they have been informed. Compulsory health insurance in Switzerland includes cost-sharing until an annual stop-loss amount, which implies the out-of-pocket costs for the drug purchases in question differ across patients. We separate patients based on whether they still face any cost-sharing at the first post-treatment purchase. Although individuals who financially benefit from switching to a cheaper generic show a greater treatment effect than patients with no cost-sharing for both the generic and the branded versions, this difference only amounts to slightly more than 2.5 percentage points. Financial incentives thus merely provide an additional 10% change in patient behavior beyond the effect of providing

[1]This share is non-zero as the communication process did not recheck whether a targeted patient had already switched (back) to a generic after the initial brand purchase that triggered inclusion in the campaign before the final dispatch.

specific information on the availability of generic alternatives. A back-of-the-envelope calculation shows that patient information constitutes a highly cost-effective measure to reducing healthcare expenditures. The one-time cost per letter was less than a Swiss franc, yet lead to additional yearly savings of over 36 Swiss francs per dispatched letter.

Our findings contribute to the growing literature on the significance of consumer information in healthcare decisions. Bronnenberg et al. (2015) show how the acquired domain expertise of healthcare professionals results in higher adoption of generic drugs compared to the general public. Acquiring knowledge is particularly challenging for patients without a healthcare background, as restrictions on consumer-directed information provision are often more stringent for healthcare products and services than for other goods. For example, many countries ban direct-to-consumer-advertising (DTCA) for pharmaceutical drugs. These additional informational frictions may impose welfare losses, as Shapiro (2022) finds that television advertisements for antidepressants in the US markedly decrease absenteeism at work due to previously untreated individuals learning about the existence of potentially appropriate drugs. Sinkinson and Starc (2019) similarly show the cost-effectiveness of DTCA in attracting new customers to a category of highly effective drugs, namely statins, even to the non-advertised generic versions. However, large-scale advertising campaigns by pharmaceutical firms are resource-intensive and directly organized by the seller of the product. In the context of generic drugs, Carrera and Villas-Boas (2023) provide an example of how a simple, inexpensive and patient-directed information treatment by a (non-medical) third party at the point of sale can increase substitution, but also that framing plays a vital role.[2] Even in the absence of legal barriers, physicians remain the predominant source of information for (potential) patients. If the designated provider of both information and medical treatments is the same individual, agency problems can arise(Clemens and Gottlieb, 2014). Unless otherwise addressed, such asymmetric information can influence treatment decisions, as Johnson and Rehavi (2016) show that better informed patients (in their case, physicians themselves) are protected from financial incentives of medical providers determining even vital medical decisions as childbirth delivery.

The rest of this paper is structured as follows. In Section 1, we describe the setting of our study, pharmaceutical drugs in Switzerland and the generics information campaign. Next, Section 2 explains our empirical strategy using a staggered treatment event study design, while Section 3 details the health insurance claims data we employ. Section 4 presents our main results and subgroup heterogeneity analyses, before Section 5 offers concluding remarks.

[2]Similar to the generics mailing campaign we analyze, seemingly minor information interventions can also alter financially harmful choices in the context of health insurance plans. Goldin et al. (2020) find that a letter providing information on a tax penalty for lacking health insurance coverage and on how to acquire coverage increased enrollment substantially.

1 Setting

1.1 Generic Substitution

Following the expiration of patent protection for a brand-name drug, other manufacturers are permitted to produce generic versions based on the same active ingredient that offer equivalent therapeutic benefits. Since the expensive drug development and trial process does not have to be repeated for generics, prices can be set close to marginal costs of production. The resulting discount of up to 90% relative to the branded counterparts, underscore the significant cost-saving potential for overall health care expenditures inherent in generic substitution. Policymakers worldwide have consequently instituted a variety of strategies to encourage the shift from branded to generic drugs. Given the pivotal role of medical providers in determining drug selection, these policies mainly target physicians and pharmacists. These approaches predominantly involve both non-financial mandates and added flexibility, such as prescribing only the active substance, rather than a specific brand, and empowering pharmacists to substitute generics (Socha-Dietrich et al., 2017). In contrast, patient-centric policies have mostly focused on augmenting the financial burden for those choosing brand-name drugs. Apart from broad public awareness campaigns, there has been a notable paucity of initiatives aimed directly at motivating patients to choose generics. This gap in policy initiatives could be attributed to the limited credible empirical evidence on factors influencing patients' choice between generic and brand-name drugs, particularly beyond financial incentives.

A burgeoning segment of recent literature underscores the significance of patient inertia and a propensity to adhere to physicians' drug choices, especially when patients lack access to alternative sources of information that are both readily available and comprehensible. Granlund and Sundström (2018) illustrate how patients' conflicting desires to follow their doctor's prescription while also selecting the least expensive option can lead to welfare losses in instances where physicians do not recommend generics. Janssen and Granlund (2023) use a somewhat similar design as us in our empirical application and discover that a patient's initial decision not to refuse a generic substitution significantly influences their likelihood of opting for generics in subsequent purchases. Song and Barthold (2018) exploit exogenous changes across various US states' laws regarding generic substitution and find that unless patient consent is not required, allowing pharmacists to substitute has limited impact due to the strong preferences of patients to stick with their doctor's initial brand prescription. This heavy reliance of patients on their physicians, presumed to act in the patients' best interests, can be problematic, particularly when physicians' financial incentives are misaligned. Liu et al. (2009) present evidence that financial considerations significantly sway the probability of generic substitution among physicians who both prescribe and dispense drugs. Addressing this overreliance may not require complex interventions, as the findings of Ito et al. (2020) suggest that minor external

nudges can effectively counter patient inertia regarding generic substitution. Nonetheless, patients are also susceptible to financial incentives. Dafny et al. (2017) demonstrate that the likelihood of patients opting for generics diminishes considerably when pharmaceutical companies offer copay coupons for brand-name drugs.

1.2 Health Insurance and Prescription Drugs in Switzerland

Similar to the Netherlands, Germany, and the marketplaces in the Affordable Care Act (ACA), compulsory health insurance in Switzerland is based on principles of regulated competition (the following description draws on Schmid et al., 2018). While regulation guarantees risk solidarity, individual affordability, accessibility of health plans, and access to care, competition among insurers and health care providers should promote quality and efficiency. Consumers can freely choose from approximately 60 private health insurers during the annual open enrollment period (there is no public option). In the standard health plan, which all insurers must offer, consumers have unrestricted choice of health care provider, an individual deductible of 300 Swiss francs and generally a co-insurance rate of 10% up to the stop-loss amount of 700 Swiss francs, which both reset yearly. However, consumers can opt for preferred provider or telemedicine health plans and choose higher deductibles ranging from 500 to 2,500 Swiss francs. Both choices lead to a lower premium, albeit subject to strong regulations to preserve risk solidarity. Notably, every health plan has to offer identical coverage for services, including prescription drugs. While supplementary health insurance plans exist, these exclusively offer additional services and as such do not impact prescription drugs.

Compulsory health plans have to cover (prescription) drugs that are listed in the so-called *specialties list*, which is compiled and published monthly by the Federal Office of Public Health (FOPH). In order to be listed, a drug first has to be approved by the national drug approval agency named *Swissmedic*. Subsequently, its producer has to bargain with the FOPH on the ex-factory price, which then applies uniformly to all medical providers and health insurance plans. While launch prices of new brand-name drugs are determined by reference pricing using comparison countries and similar, already listed drugs, launch prices of generics are based on the price and market volume of the corresponding brand-name drug (see Lötscher et al., 2024, for further details). Consequently, generic drugs are generally less expensive than brand-name drugs, though there is considerable variation in ex-factory prices per unit among substitutable drugs. Retail prices vary even more markedly as the (regulated) distribution margins increase step-wise in the ex-factory price.

Health plans reimburse the retail price for drugs either directly dispensed by a physician or prescribed by a physician and then dispensed in a pharmacy.[3] While physicians

[3]Some Swiss cantons (partly) allow physicians to dispense drugs, that is, physicians are allowed to sell drugs in the office (for further details, see Kaiser and Schmid, 2016; Trottmann et al., 2016; Burkhard et al., 2019).

only earn the distribution margins on dispensed drugs, pharmacists additionally receive consultation fees to compensate them for their services. Both dispensing physicians and pharmacists have an incentive to sell more expensive, typically brand-name, drugs due to higher margins (Müller et al., 2023). However, there are several measures on the supply and the demand side to encourage generic use. First, pharmacists have the right to substitute a prescribed brand-name drug with generic versions unless explicitly indicated otherwise by the prescribing physician. In addition, physicians and pharmacists have to inform patients about the availability of generic drugs listed on the specialties list.[4] Pharmacists also receive a one-time payment for substituting a patient's brand name prescription for the first time, providing a modest financial incentive. Second, for substitutable drugs exceeding a certain price threshold, patients incur a co-insurance rate of 20% instead of 10% (see Lötscher et al., 2024, for details), intended to motivate drug manufacturers to reduce prices and patients to select less expensive options. While this policy successfully lowered drug prices, its impact on generic drug utilization has been minimal, similar to other implemented measures.

1.3 Generics Mailing Campaign

In 2010, Switzerland's largest health insurer initiated a mailing campaign designed to encourage generic substitution among its clientele.[5] Rather than conducting a ubiquitous campaign to raise general awareness about generic drugs for all clients, this initiative was specifically directed only at patients who had recently purchased a brand-name drug. Initially, the campaign commenced with dispatches concerning three different drug substitution categories, expanding to encompass 20 categories in the following years.[6] Inclusion criteria stipulated that the drugs must be for long-term treatments for chronic conditions and exhibit sufficiently large price differentials between the brand-name and generic versions. Furthermore, to guarantee reliable accessibility of established substitutes, at least three generic alternatives had to be available in the corresponding drug category.

Content — Each informational letter started with a uniform introduction elucidating that generics are less costly alternatives that contain the same active ingredient as their brand-name counterparts, which the FOPH monitors. Subsequently a tailored section informed the recipient about the existence of generic alternatives for their specific branded medication, followed by an alphabetically ordered list of currently available generic versions. The letters culminated by indicating the potential cost savings of switching to the least expensive alternative (expressed in relative terms as a percentage figure) and ad-

[4] Although the law does not further detail what this information needs to entail or possible sanctions for violating the requirement.

[5] The Federal Office of Public Health banned informational letters aimed at relevant patients in 2022, deeming them to be in violation with data protection laws.

[6] Table A1 in the Appendix provides a list of included drug categories alongside the respective number of letters sent and inclusion dates.

vising patients to consult with their healthcare provider or pharmacist to determine the most appropriate generic medication for their treatment. The letters were disseminated in German, French and Italian, corresponding to the patient's preferred contact language. An English translation of a sample letter is exhibited in Figure A6 in the Appendix.

Mailing procedure — The process governing the dispatch of generic drug mailings was automated and constituted a component of the broader marketing communication system employed by the health insurer. The initiation of this process at the insurer was contingent upon receiving a claim for a brand-name drug listed in the substitution groups included in the campaign. Health insurers typically receive such claims with some delay subsequent to the actual purchase. This delay arises either from drug providers consolidating individual patient claims into a single monthly bill or from patients who, having directly paid for the drug at the point of sale, defer submitting their bill until a later point in time (such as when their annual expenditures reach their deductible threshold). Consequently, the time lapse between purchase and claim submission introduces a largely randomized initial element of timing variation into the mailing process. Upon receipt of a claim for a branded drug on the specified list, the system initiates a verification process to ascertain whether the individual satisfied additional eligibility criteria. Excluded from the generics campaign are children, adults beyond the age of 85, and patients receiving home care services. Once an individual is deemed eligible, a lead is generated, thereby enrolling them into the campaign and commencing the standard marketing communication procedure. An obligatory waiting period of a minimum of three weeks ensues following the claim's receipt. Subsequent to this interval, the system becomes primed for the potential dispatch of a letter. However, to prevent inundating clients with excessive simultaneous communications, the system imposes a cap on the volume of correspondence issued within a given time frame.[7] Each communication category, including the generics letters for each drug group separately, is assigned an internal priority ranking.[8] This ranking dictates the sequence of dispatch in instances where multiple communications are queued simultaneously (letters already in the queue can also be pushed back further by later incoming leads). In such cases, all correspondence, barring the one with the highest priority is temporarily deferred. This prioritization check is conduced every 14 days (on Saturdays) and thus represents the shortest additional delay arising from communication blocking. Additionally, each communication item is also assigned a specific interval, often exceeding the two-week minimum and usually lasting well over a month, during which it precludes the dispatch of other communications. If no higher-priority item is identified during the

[7]This system applies solely to marketing communications. Correspondence related to billing (for both insurance premiums or medical claims) or the annual insurance quote issued at close to year-end does not affect the timing of letter dispatch in the marketing system.

[8]If clients have brand purchases in different medication categories, they receive a separate letter for each drug group. However, there is an additional three month minimum interval imposed before the next generics letter can be sent after the previous one.

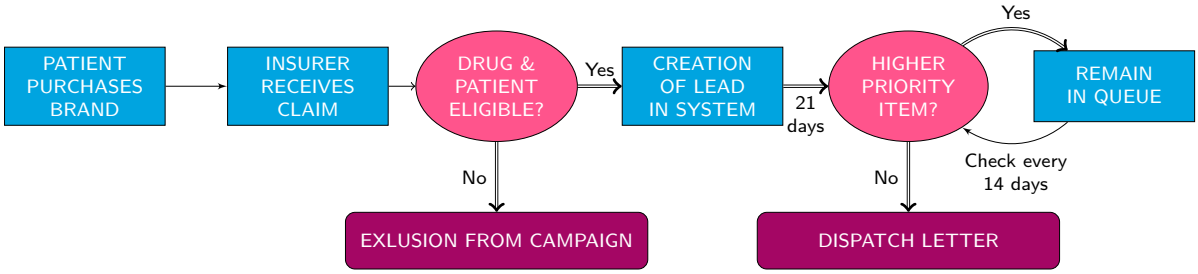


Figure 2: Generics Mailing Procedure Steps

check, the generics letter is dispatched via regular mail on the following Monday, typically requiring an additional two to three days for delivery to the client. Figure 2 provides a simplified overview of this process.

Ultimately, these delays — which are reasonably exogenous to the decision-making process between branded and generic drugs — engender considerable variation in the duration between the initial purchase, which triggers the mailing process, and the eventual dispatch of the letter across different patients.

2 Empirical Strategy

2.1 Event Study over Drug Purchase History

Neither the content nor the process of the mailing was conceived within an experimental framework aimed at investigating the causal effect of the informational letter. In scenarios involving repeated decisions, such as purchases of chronic medication, there is an increasing likelihood of individuals becoming more knowledgeable over time. Information could emerge from patients inquiring about more cost-effective generic alternatives or from healthcare providers disclosing these options during successive prescriptions. Under these circumstances, generic substitution becomes more likely with each purchase, irrespective of the patient receiving an informational letter. Notably, the campaign system did not verify whether the patient had already transitioned to a generic option since creation of the lead before dispatching the letter. Additionally, some activations of the mailing process may have originated from patients who typically opt for generics but made an exceptional brand-name purchase, possibly due to temporarily unavailable generic versions on the particular day.

A naïve approach of simply considering the letters responsible for all switches to generic alternatives afterwards therefore leads to overestimating the causal impact of the informational letter. Instead, we harness the quasi-random, exogenous delays in the mailing process (detailed in Section 1.3). At each subsequent purchase within a drug group, a proportion of patients will have already received the informational letter, while others have not yet. Our novel approach thus mimics a natural experiment, where there is a quasi-

random division into groups: those who have not yet received the treatment and those who have. Should self-informed decision-making become increasingly probable with each purchase, our control group's evolution should accurately reflect changes in substitution probability due to factors other than the informational letter. Leveraging the exogenous variation in treatment timing within purchase histories thus enables us to estimate the causal effect of providing information to patients on their propensity to choose generic drugs. Our approach ultimately parallels a standard event study design with staggered treatment adoption, with the unique aspect of substituting standard time measures, such as years, with the sequence of drug purchases within a substitution group.

A client may receive multiple generics letters pertaining to different drugs. Nevertheless, our analysis concentrates on the drug group corresponding to the patient's initial informational letter. Receipt of a subsequent letter for another drug group implies a brand-name purchase within that second group. Thus, the population receiving multiple letters likely exhibits a general reluctance to switch to generics (or the initial treatment only works within the specifically targeted drug group). This leads to heterogeneous control groups, with some individuals having already experienced a "partial treatment" prior to the actual treatment in the second drug group. Conversely, patients who switch to generics in both the initially targeted and subsequent drug groups will not receive additional letters, thus excluding purchases in other drug groups from our analysis. By focusing exclusively on the first targeted drug group, we ensure a homogeneous population experiencing a known uniform treatment. The sole remaining variation being the timing of treatment within each individual's purchase history. Consequently, we observe a single sequential drug purchase history for each individual who has ever received an informational letter.

2.2 Method

Our empirical setting corresponds to a slightly adapted version of an event study with staggered treatment adoption. Instead of considering the outcome at different points in time, we compare outcomes at different purchase numbers. As described in the previous section, our unit of observation is the patient-drug purchase. In line with the recent advancements in the econometrics literature (Borusyak et al., 2022; Callaway and Sant'Anna, 2021; Goodman-Bacon, 2021; Roth et al., 2023; Sun and Abraham, 2021) we eschew the conventional two-way fixed effects (TWFE) model for estimating the causal effects of the informational letter on generic drug purchases. Instead, we employ the estimator suggested by Callaway and Sant'Anna (2021).

We now elaborate on our setting in more detail. For each patient i, we observe all purchases $c \in \{1, 2, ..., 10\}$.[9]We classify patients into different treatment cohorts $g \in$

[9]This applies for the majority of patients. However, as expounded in Section 3, we allow the panel to

$\{3, 4, ..., 10\}$, with g denoting the first purchase following the letter's dispatch. As all patients in our sample eventually receive the treatment, there is no never treated group that could serve as a control group. Therefore, we rely on the not-yet-treated patients as controls. Callaway and Sant'Anna (2021) suggest three different estimands to identify causal effects (outcome regression, inverse probability weighting, doubly-robust). Given the lack of necessity to condition on covariates (pre-treatment outcomes are adequately similar across cohorts, as we will later show), we opt for the outcome regression (OR) approach.

The main estimation consists of a a two-step procedure. First, a series of cohort-purchase number average treatment effects on the treated (ATTs) are nonparametrically identified using OR, defined as

$$\text{ATT}(g, c) = E[Y_c - Y_{g-1}|G_g = 1] - E[Y_c - Y_{g-1}|D_c = 0], \tag{1}$$

where $D_c = 0$ for all $g > c$, i.e. all cohorts that are not yet treated at purchase c. Subsequently, these cohort specific estimates are then aggregated to obtain event study type estimates,

$$\theta_{es}(e) = \sum_{g \in G} \frac{n_{g,e}}{n_e} \text{ATT}(g, g + e), \tag{2}$$

with e representing the relative purchase ($e = c - g$), $n_{g,e}$ indicating the number of patients in treatment cohort g observed at relative purchase e, and n_e the total number of units observed at e. This aggregation yields an estimate for each relative purchase number under consideration $e \in \{-3, ..., 1\}$.[10]

3 Data

3.1 Data Sources

Our study principally utilizes individual-level data provided by the health insurer responsible for the generic drug information campaign. The core dataset encompasses a comprehensive panel of all medication purchases by clients who received a generics information letter.[11] Each transaction record includes a unique identifier for each specific drug, the type of dispenser, cost allocation between patient and insurer, and the exact date of purchase. This allows for the creation of an ordered purchase sequence within

be unbalanced if a patient has less than 10 total purchases within the relevant drug category.

[10] given that we only observe two pre-tretment purchases for the cohort first treated at the third purchase $g = 3$, this cohort is not included in $e = -3$.

[11] Due to bundled payment for inpatient treatment, drug consumption is not separately itemized and thus not included in our claims data. Given the absence of patient choice in drug selection during such stays, this does not pose a problem for our study of generic substitution.

each drug substitution group,[12] with multiple packages from the same drug group on the same date being considered as one transaction.

As our interest lies in decisions between brand and generic drugs, we commence the enumeration of purchases only when at least one alternative to the brand-name drug becomes available.[13] Additionally, we exclude "purchases" made in hospitals as part of outpatient treatment, as patients usually are precluded from making their own choices. Thus, each numbered instance in the respective patient's purchase history should represent observed outcomes where individuals exercised direct agency in the decision.

Data regarding the informational letters mainly encompasses the targeted drug group and the dispatch date.[14] We then assess whether a purchase transpired before or after the dispatch of the letter, thereby creating a binary pre- or post-treatment period indicator. Following standard event study methodology, we then re-enumerate purchases in relation to the dispatch of the informational letter. Zero denotes the first purchase made by the patient subsequent to receiving the treatment.

3.2 Data Preparation

From 2010 to 2018, approximately 200,000 informational letters were sent as part of the generics campaign.[15] As explained in Section 2.1, we focus solely on the first drug group for which a patient received the informational treatment. Combined with the initial exclusion criteria on purchases (and the removal of clients with erroneous or incomplete data), and the necessary exclusion of patients who did not make any further purchases of the relevant drug post-treatment, our sample reduces to roughly 100,000 letters, i.e., individual patients.

We observe that about 20% of the individuals received the informational letter between their first and second purchases (as counted in our methodology). While the control group (the not yet treated) should largely reflect any general trend towards generic substitution following the initial purchase, their inclusion could nonetheless lead to an overestimation of the letters' impact. Therefore, we adopt a conservative approach and focus only on individuals who received the treatment after their second purchase at the earliest. The proportion of not-yet-treated individuals declines with each successive purchase. Relying on these patients as the control group implies increasing disparity between the already treated and control group as the purchase count rises. We set a threshold of only including

[12] We define a drug substitution group by the active ingredients of the brand version of the drug.

[13] Data concerning available alternatives (and prices) on the level of each drug group is derived from a modified version of the publicly available "specialities list" the FOPH publishes once per month.

[14] While we cannot determine the exact transaction that triggered inclusion in the campaign, particularly in cases involving repeated brand purchases, this detail is not crucial for our identification strategy.

[15] Although the campaign (temporarily) concluded in early 2020, we confine our analysis to letters sent until the end of 2018. This ensures a complete year of observation for all patients prior to the onset of the Covid-19 pandemic, which could have influenced purchase decisions due to factors such as drug shortages and hoarding behavior.

patients who received treatment by their 10th purchase, thereby removing an additional approximately 10,000 individuals from our dataset.[16] Lastly, we restrict our sample to include only patients with at least one purchase within both the 180 days preceding and following the dispatch of the letter. Again, this criterion is intended to ensure that any observed changes in purchasing behavior are more likely attributable to the informational treatment rather than other external factors. Our final sample comprises 61,456 patients and thus purchase histories within the treated drug group. We limit our analysis to encompass the first 10 purchases, although do not mandate that patients fully complete this number of transactions. This results in a slightly unbalanced panel, totaling 538,797 observations. On average, we observe 8.8 purchases per individual.

3.3 Summary Statistics

Table 1 provides summary statistics for our sample at purchases across different stages of treatment: before receiving the informational letter, at the first purchase after the letter and the subsequent purchases afterwards. On average, the interval between drug purchases within the same category is approximately 106 days both in the pre-treatment period and at the first purchase post-letter, equating to slightly over three months. This aligns with expectations, given that a drug package typically contains a total dosage to last for a three-month course. Contrarily, the intervals extend to about four months in the remaining period following the letter.

The drug categories targeted in the generics campaign are relatively high-priced, with average costs of 67 Swiss francs pre-treatment, 64 Swiss francs just after the letter and in the subsequent period (measured by the list prices in the category at the time of purchase, not the average price paid by patients). Hence, these negligibly lower prices post-treatment do not indicate any changes in drug choices arising from general changes to the price environment coinciding with the timing of the letter. Substantial cost-saving opportunities persist throughout the entire observation period. Switching from the most expensive brand name drug to the most affordable generic alternative within a substitution group can yield average savings between 44 and 46.5 Swiss francs across the periods. These represent savings in the range of 42%–45% relative to the highest-priced drug. We thus observe modestly higher savings opportunities post-treatment, however we deem it unlikely that these changes are of sufficient magnitude to explain any large shifts towards generics even in a hypothetical absence of the informational letter.

The number of available generic alternatives within each substitution group increase as purchase counts rise, from just under six pre-treatment to around seven options post-letter. As more time passes since patent expiry, more generic producers enter the market. However, we would argue that already during purchases prior to the letter, the choice set

[16] These decisions have minimal effect on our results, however.

Table 1: Summary Statistics

	Before Letter		First After Letter		Remaining After	
	Mean	SD	Mean	SD	Mean	SD
nth Purchase of drug	2.93	1.87	4.88	1.95	7.39	1.85
Days since previous purchase of drug	106	150	106	49.0	119	142
Average drug price (in CHF)	67.3	34.1	63.9	27.4	63.9	26.2
Potential savings by switch to generic (in CHF)	44.3	31.3	46.5	30.0	45.2	27.9
Potential savings by switch to generic (rel.)	0.42	0.15	0.45	0.13	0.44	0.13
Available alternatives for drug	5.53	2.29	6.68	2.10	7.01	2.15
Any copayment by patient	83.1%		80.9%		83.6%	
Physician dispensed drug	29.9%		31.0%		31.3%	
Patient living in Latin language canton	44.7%		44.5%		44.2%	
Female patient	52.8%		51.8%		51.3%	
Patient age (at purchase)	64.3	13.9	64.9	13.9	66.0	13.3
Lowest deductible model	68.0%		68.1%		68.5%	
Total health care exp. in year of purchase	10,569	16,157	10,509	16,012	9,409	14,425
Observations (drug purchases)	238,627		61,456		238,714	
Unique individuals with drug purchases	61,456		61,456		54,953	

Note: "Before Letter" summarizes the outcomes of interest at all purchases that occurred before the patient received the letter. "First After Letter" corresponds to the average outcomes at the time of the first purchase after the letter. "Remaining After" summarizes the outcomes of interest at all purchases that occurred after the first treated purchase (i.e., $e > 0$). All cost-related outcomes are measured in CHF. In the period "Remaining After" we observe around 11% individuals less, as we do not condition our sample to be observed for all purchases after the first treated purchase. This indicates that we have an unbalanced panel which however hardly impacts our results as robustness-checks show.

of patients was rather large and the emergence of an additional option on average post-treatment is unlikely responsible for large portions of patients to switch to generics. Over 80% of patients incur at least some out-of-pocket drug costs at the respective purchase, with this share remaining roughly constant over the different treatment periods. This indicates the presence of financial incentives to substitute generics for patients both before and after receiving the informational letter. Any changes to patient choices post-treatment should thus not arise from altered incentives. About 30% of drug purchases were made directly from the physician, with the majority (69%) coming from pharmacies, again without any substantial shifts between pre- and post-treatment.

Considering patient demographics, around 44% of patients live in a majority Latin-language canton, encompassing the French-speaking regions of Switzerland or in the Italian-speaking canton of Ticino. There are slightly more female than male patients in the sample with the share of the former approximately 52%. Given that many drugs involved in the generics campaign are intended for chronic conditions prevalent among older individuals, the average patient age is notably high with 64 in the pre-treatment period, increasing to 65 at the first post-letter purchase, and 66 subsequently. Around 68% of patients opt for the lowest deductible level (300 Swiss francs), which is consistent with their health care expenditures that average at around 10,500 Swiss francs in the pre-treatment period and the year of the first purchase after the letter. Health care

expenditures are marginally lower in years of later purchases, averaging about 100 Swiss francs less. In total, our sample consists of 61,456 individual patients for which we observe 238,627 distinct pharmaceutical purchases pre-treatment, with each individual also observed by requirement at their first post-treatment purchase. Around 10% of initial patients are no longer observed in the remaining periods, where we still record additional 238,714 pharmaceutical purchases from 54,953 individuals.

4 Results

4.1 Descriptive Evidence

We first present the probability of a generic drug purchase at the n-th purchase for all treatment cohorts ($g \in \{3, 4, ..., 10\}$) in Figure 3. The different cohorts are represented by colored lines, with the corresponding treatment cohort numbers. While none of the groups received treatment before the third purchase, we note a baseline probability of 10.2% for generic drug selection during the pre-treatment period across all cohorts. This indicates that a subset of individuals had already opted for generic alternatives even before receiving the treatment. For some cohorts this share increases incrementally up to at most about 15%, especially among cohorts treated at later stages. This suggests that a relatively minor fraction of patients may self-learn about generic substitution, but it is more probable that the majority of pre-treatment generics purchases represent "unintentional" one-time brand buys. The observed decline in the generic drug share immediately preceding treatment also supports this hypothesis. With the trigger purchase often being the one immediately before the letter's dispatch, the temporary increase in brand-name selections likely arises from patients who regularly chose generics in previous purchases. Given the similar trends across all cohorts, this pattern should not adversely impact our subsequent analysis using a staggered treatment event study design.

Examining the initial purchase following the dispatch of the informational letter, we observe a significant shift in the average generic share, increasing by approximately 25 percentage points. Before the treatment, roughly one in eight purchases involved a generic drug; this proportion escalates to one in three post-treatment. Cohorts treated later exhibit a marginally lower response to the informational treatment, with the initial increase being closer to 20 percentage points. A diminished impact on more experienced patients is plausible, as some individuals might have independently become aware of generic options but consciously do not switch. Beyond the first post-treatment purchase, the probability of choosing a generic drug continues to rise with each additional purchase, with the most notable increase occurring at the second treated purchase. However, from the third post-treatment purchase onward, the rate of increase stabilizes and becomes mostly linear. This pattern suggests that the influence of the informational letter diminishes after this

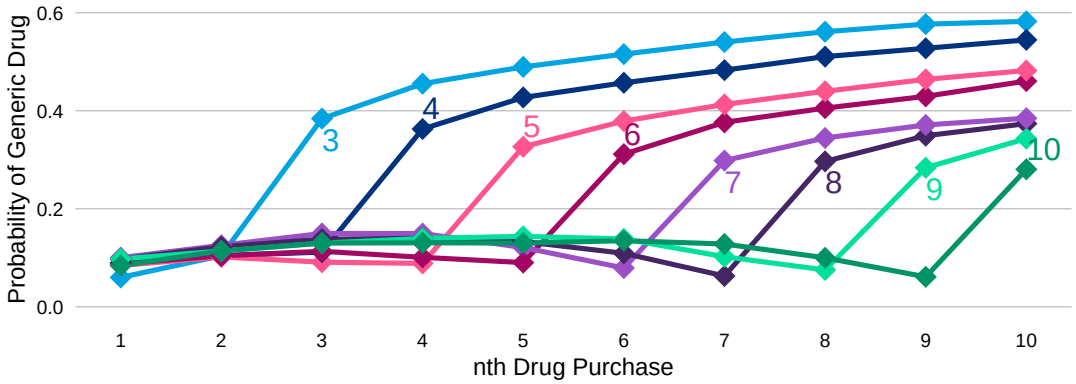


Figure 3: Share of Generic Drugs at each nth Drug Purchase Across Treatment Cohorts

Note: Diamonds represent raw means for the seven treatment cohorts at each of the ten purchases within the same drug substitution group we include a patient for. Figure A1 in Appendix A shows the number of observations in each of the cohort-nth purchase combinations shown here.

point, with subsequent marginal increases likely due to patients obtaining information from other sources. This observation reinforces our decision to exclude purchases beyond the second post-treatment in our event study, as attributing further rises in the generics share to the informational treatment becomes increasingly speculative. The significant uplift in generic share at the second treated purchase is likely a direct effect of the letter. Considering the delivery time of standard mail and the time required for recipients to read the letter, it is evident that for many, their second post-dispatch purchase effectively constitutes their first informed decision. A closer analysis reveals that the generics share in the first post-treatment purchase remains at baseline levels for at least up to five days after the letter's dispatch. Therefore, for a subset of clients, their second purchase post-dispatch in reality represents their first decision-making opportunity with the newly acquired information.

4.2 Event Study Estimates

We now proceed with our primary results from the event study design, which are presented in Figure 1. Echoing the descriptive evidence in Section 4.1, we obtain an Average Treatment Effect on the Treated (ATT) for patient information of a 25.8 percentage point increase in the probability of switching from brand-name to generic drugs in the first treated purchase.[17] Owing to the substantial effect magnitude and the large sample size, we can decisively reject the null hypothesis at any conventional significance level.[18] Relative to the pre-treatment baseline probability of 10.2% for selecting a generic drug, the impact of the informational letter is profound, elevating this share to 3.5 times its original size immediately after treatment.

[17] Table A2 in the Appendix shows the full pairwise difference-in-differences coefficients.

[18] In fact, the 99% confidence intervals using standard errors clustered on the patient level, as depicted in Figure 1, are virtually imperceptible.

As with the descriptive findings, we assert that attributing further changes in generic substitution at the second post-treatment purchase to the letter is justifiable, even in our generally conservative approach. The ATT estimate at this juncture corresponds to 33.4 percentage points, together with the previous purchase resulting in a cumulative ATT of 29.6 percentage points. This demonstrates that already a simple, yet specific and targeted informational letter, primarily listing available alternatives, can quadruple the rate of substitution. The evident lack of adequate patient information and attentional barriers are significant impediments for brand-buyers transitioning to more affordable generic alternatives. Despite health insurers (at least in Switzerland) often being ranked low in trust among healthcare system actors in patient surveys, the minimal level of patient awareness renders even such sources influential in persuading approximately one-third of previous brand-buyers to switch to generics upon realizing their consumer choices. Given that the letters originated from an automated system and were sent via regular mail, at a total cost of less than one Swiss franc each, they represent a highly cost-effective intervention. A back-of-the-envelope calculation suggests that each letter yielded additional annual savings of approximately 36 francs for the targeted drug alone, underscoring the efficiency of targeted patient information as a policy strategy to influence patient behavior.

To conclude our main analyses we perform two additional estimations. As discussed in Section 3.2, we do not require patients to have at least 10 claims for inclusion in our sample, resulting in a slightly unbalanced panel analysis thus far. To evaluate the potential impact of this, we rerun our analysis using only the data from the 44,374 individuals with a complete set of 10 purchases, thus excluding about 15,000 patients). Figure A2 in the Appendix compares the estimates from our primary sample with those from the balanced dataset. The latter's estimates align closely with the former, indicating no discernible bias from the lack of a fully balanced panel. If anything, the balanced estimates are marginally higher. Lastly, instead of aggregating the ATT over purchases relative to the informational letter, we analyze it across the seven treatment cohorts. Figure A3 in the Appendix depicts these cohort-specific heterogeneity estimates. Intriguingly, the informational treatment exhibits nearly a uniform effect across cohorts, irrespective of the number of prior purchases, even when being informed about having a consumer choice only after multiple purchases of the drug. This suggests that patients influenced by the letter likely lacked any prior knowledge of generic alternatives for their medication, as well as the means to acquire such information.

4.3 Subgroup Differences

In our concluding series of analyses, we segment patients into subgroups to investigate potential differences in the influence of the informational letters on their drug selection. Unless noted otherwise, these heterogeneity analyses segregate all purchases at the patient

level into distinct groups based on the classification determined by the patient's status at the time of their first-post-treatment purchase. Subsequently, we apply the same estimation procedure as in our primary analyses to each subgroup separately. The independence of the two samples enables simply checking whether the two resulting confidence intervals overlap to determine if we can reject the null hypothesis of no effect disparities between groups.

Given that many policies to encourage generic substitution heavily rely on price mechanisms, our initial analysis assesses whether the letter exerts a greater impact on patients who have a stronger financial incentive for switching to a less expensive generic alternative. The letter's quasi-random timing should also assure that categorizing groups based on whether the annual stop-loss limit was reached by the time of the first post-treatment purchase does not introduce biased selections. The first panel in Figure 4 directly compares the overall ATTs of these two groups. Predictably, patients with financial incentives for switching to generics are more likely to do so post-treatment compared to those for whom both the brand and generics are (spot) priced identically at zero. We estimate an ATT of 30.1 percentage points for the former group and in the latter an ATT of 27.5 percentage points, with the difference being statistically significant at the 1% level. The marginal effect attributed to financial incentives, when compared to the role of information alone, is therefore less than 10%.[19] We can only speculate on the reasons why roughly a third of patients who have no financial incentive to switch to a generic do so. One explanation could be the emphasis in the letter that generics help to reduce overall health care expenditures, appealing to patients' sense of contributing to a public good. Others might choose generics as the same good for a lower price as a matter of principle, once informed about their options. Both underscore the promise of independently provided patient information for future health care policy-making. Figure A4 in the Appendix also suggests the potential of combining financial incentives with direct and easily understandable patient information. If the letter indicated higher relative savings for the drug group in question, patients were more inclined to switch to a generic alternative.

Furthermore, we examine the differential impact of the informational treatment across drug dispensation locations and patient age groups. For the analysis concerning physician dispensation, we restrict the sample to patients in German-speaking cantons permitting this practice.[20] In this instance, subgroup classification is based on whether a physician

[19] In a subsidiary analysis, we further subdivide the group having to pay for the drug at least partially: those still below deductible and those above deductible but below stop-loss (i.e., patients pay 20% of the brand, 10% of the generic price). Among patients retaining the entire price differential between brand and generic, the effect is slightly larger. The ATT in the co-insurance group falls between the no cost-share group and the full cost-sharing group, indicating that financial incentives do influence consumer choices in the health care market and can thus inform policy. However, the marginal changes in patient behavior are limited compared to the influence of information.

[20] All French and Italian-speaking cantons plus two German-speaking cantons only allow pharmacies to dispense drugs.

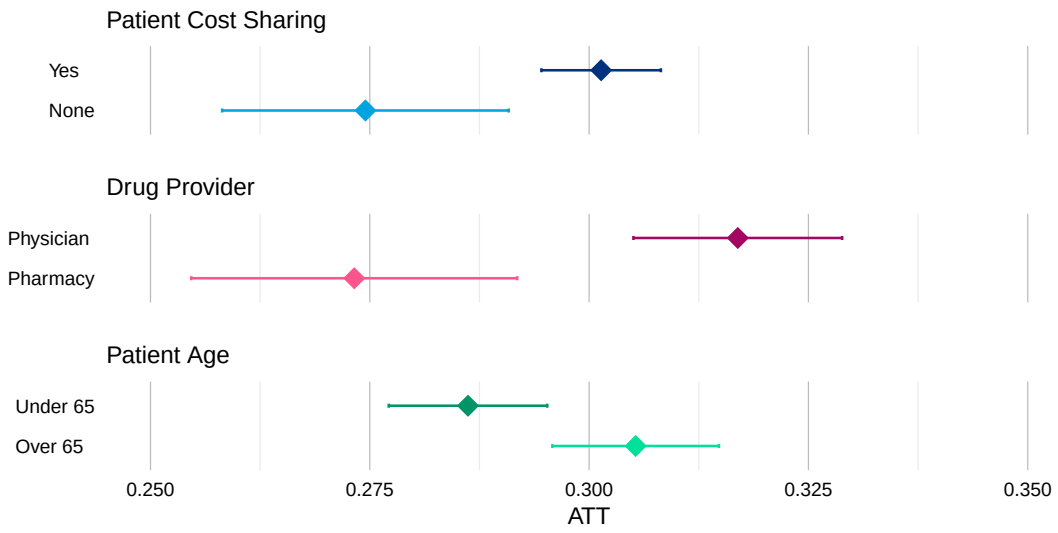


Figure 4: Estimates for Effect of Information Across Subgroups

Notes: Patients are divided into the respective subgroup depending on their observed outcome relevant for the building of the group at the first claim after the letter. Considering the place of dispensation, only patients that always lived in a canton allowing physician-dispensing, were considered in the analysis.

directly dispensed a drug to the patient at any point. This approach mitigates the potential bias wherein the intent to switch to generics as a consequence of the letter might influence the choice of dispensation location. As shown in the second panel of Figure 4, patients who received drugs from self-dispensing physicians demonstrated a markedly stronger response to the informational treatment. While the underlying reasons are again uncertain, one possibility is that physician dispensing leads to a sole medical professional as the only source of information for patients. A self-dispensing physician neglecting the legal obligation to inform about generics, then precludes patients from learning about alternatives. Visiting a pharmacy provides an additional opportunity for patients to discover substitution options. Some patients may also feel more comfortable querying pharmacists than physicians about generics if prescribed the brand version. Importantly, the significant difference arising from the place of dispensation underscores that institutional frameworks may have a more profound impact on health care costs than market mechanisms alone.

5 Concluding Remarks

Our findings demonstrate that the dissemination of clear and concise information can substantially influence patients' decisions. In the context of our analysis, an informational letter sent by a Swiss health insurer lead to a fourfold increase in the propensity for choosing cost-effective generic medications among patients who previously purchased the brand-name version of the drug. While the efficiency of the mailing campaign seems impressive — per dispatched letter it generated savings of 36 Swiss francs per year — it

is important to note that it is paper-based and its wording is primarily intended to meet legal requirements. In other words, it has not been optimized to maximize savings. Using today's technology it would be simple to make it even less expensive, more sophisticated through experimental testing and to scale it up.

Furthermore, we find that financial incentives beyond the already existing price differential provide only a marginal effect toward generic substitution compared to the impact of information itself. Almost one third of patients switch their choice even if they reap no monetary benefits from doing so. This could indicate that patients would like to make a contribution towards lower healthcare costs even if they have no direct monetary benefit from their (changed) decisions. Overall, the marked impact of a simple letter from a source with relative low levels of trust among patients, also highlights the apparent unmet demand among many individuals for more readily available information for their healthcare decisions.

In sharp contrast to our findings, policymakers in the health domain often establish additional barriers to information gathering, leading to medical professionals in time-consuming and costly one-on-one consultations frequently to constitute the sole (potentially) available source for patients seeking information. In the present case, the Swiss Federal Office of Public Health prohibited the insurer's generic mailings because the law does not allow the insurers to inform their clients about less expensive healthcare alternatives; this would be the task of physicians and pharmacists. Regarding generics, there is even a legal mandate for physicians and pharmacists to inform their patient about the possibility of generic substitution. In view of this regulation, the efficacy of the insurer's generic mailing is rather surprising. As dispensing brand-name drugs results in higher revenues to medication providers, however, we further highlight the pitfalls of policies restricting information provision to medical providers only.

The results of our research indicate a marked underutilization of a simple yet potent tool: Informed patient choice. By empowering patients with relevant information, we observe a notable shift in their decision-making process. Hence, informed choices can profoundly reshape (or even enable the emergence of) market dynamics in the healthcare sector. The implications of this are twofold. Firstly, it suggests a reevaluation of current healthcare policies, which often underemphasize the role of patient education and awareness. Secondly, it underscores the potential for information dissemination strategies to significantly enhance the efficiency of healthcare markets. Well-informed consumers make choices that not only benefit them individually but also lead to more efficient market outcomes.

While we have concentrated on the pharmaceutical sector, the principles uncovered may well apply to other areas of healthcare. Further research is needed to explore the applicability of our findings in different contexts and to understand the long-term effects of informed patient choices on healthcare systems.

References

Arrow, Kenneth J., "Uncertainty and the Welfare Economics of Medical Care," *The American Economic Review*, 1963, *53* (5), 941–973. Publisher: American Economic Association.

Baicker, Katherine, Sendhil Mullainathan, and Joshua Schwartzstein, "Behavioral Hazard in Health Insurance *," *The Quarterly Journal of Economics*, November 2015, *130* (4), 1623–1667.

Borusyak, Kirill, Xavier Jaravel, and Jann Spiess, "Revisiting Event Study Designs: Robust and Efficient Estimation," April 2022.

Bronnenberg, Bart J., Jean-Pierre Dubé, Matthew Gentzkow, and Jesse M. Shapiro, "Do Pharmacists Buy Bayer? Informed Shoppers and the Brand Premium," *The Quarterly Journal of Economics*, 2015, *130* (4), 1669–1726. Publisher: Oxford University Press.

Burkhard, Daniel, Christian P. R. Schmid, and Kaspar Wüthrich, "Financial incentives and physician prescription behavior: Evidence from dispensing regulations," *Health Economics*, September 2019, *28* (9), 1114–1129.

Callaway, Brantly and Pedro H. C. Sant'Anna, "Difference-in-Differences with multiple time periods," *Journal of Econometrics*, December 2021, *225* (2), 200–230.

Carrera, Mariana and Sofia Villas-Boas, "Generic Aversion and Observational Learning in the Over-the-Counter Drug Market," *American Economic Journal: Applied Economics*, July 2023, *15* (3), 380–410.

Clemens, Jeffrey and Joshua D. Gottlieb, "Do Physicians' Financial Incentives Affect Medical Treatment and Patient Health?," *American Economic Review*, April 2014, *104* (4), 1320–1349.

Dafny, Leemore, Christopher Ody, and Matt Schmitt, "When Discounts Raise Costs: The Effect of Copay Coupons on Generic Utilization," *American Economic Journal: Economic Policy*, May 2017, *9* (2), 91–123.

Drake, Coleman, Conor Ryan, and Bryan Dowd, "Sources of inertia in the individual health insurance market," *Journal of Public Economics*, April 2022, *208*, 104622.

Goldin, Jacob, Ithai Z Lurie, and Janet McCubbin, "Health Insurance and Mortality: Experimental Evidence from Taxpayer Outreach," *The Quarterly Journal of Economics*, December 2020, *136* (1), 1–49.

Goodman-Bacon, Andrew, "Difference-in-differences with variation in treatment timing," *Journal of Econometrics*, December 2021, *225* (2), 254–277.

Granlund, David and David Sundström, "Physicians prescribing originals causes welfare losses," *Economics Letters*, September 2018, *170*, 143–146.

Handel, Benjamin and Joshua Schwartzstein, "Frictions or Mental Gaps: What's Behind the Information We (Don't) Use and When Do We Care?," *Journal of Economic Perspectives*, February 2018, *32* (1), 155–178.

Handel, Benjamin R. and Jonathan T. Kolstad, "Health Insurance for "Humans": Information Frictions, Plan Choice, and Consumer Welfare," *American Economic Review*, August 2015, *105* (8), 2449–2500.

Heiss, Florian, Daniel McFadden, Joachim Winter, Amelie Wuppermann, and Bo Zhou, "Inattention and Switching Costs as Sources of Inertia in Medicare Part D," *American Economic Review*, September 2021, *111* (9), 2737–2781.

Ito, Yuki, Konan Hara, and Yasuki Kobayashi, "The effect of inertia on brand-name versus generic drug choices," *Journal of Economic Behavior & Organization*, April 2020, *172*, 364–379.

Janssen, Aljoscha and David Granlund, "The importance of the first generic substitution: Evidence from Sweden," *Journal of Economic Behavior & Organization*, September 2023, *213*, 1–25.

Johnson, Erin M. and M. Marit Rehavi, "Physicians Treating Physicians: Information and Incentives in Childbirth," *American Economic Journal: Economic Policy*, February 2016, *8* (1), 115–141.

Kaiser, Boris and Christian Schmid, "Does Physician Dispensing Increase Drug Expenditures? Empirical Evidence from Switzerland: PHYSICIAN DISPENSING," *Health Economics*, January 2016, *25* (1), 71–90.

Liu, Ya-Ming, Yea-Huei Kao Yang, and Chee-Ruey Hsieh, "Financial incentives and physicians' prescription decisions on the choice between brand-name and generic drugs: Evidence from Taiwan," *Journal of Health Economics*, March 2009, *28* (2), 341–349.

Lötscher, Fabienne, Christian P. R. Schmid, and Michael Gerfin, "The effect of potential higher out-of-pocket payments on drug prices and quantities," Mimeo, University of Bern, Bern March 2024.

Müller, Tobias, Christian Schmid, and Michael Gerfin, "Rents for Pills: Financial incentives and physician behavior," *Journal of Health Economics*, January 2023, *87*, 102711.

Roth, Jonathan, Pedro H. C. Sant'Anna, Alyssa Bilinski, and John Poe, "What's trending in difference-in-differences? A synthesis of the recent econometrics literature," *Journal of Econometrics*, April 2023.

Schmid, Christian P.R., Konstantin Beck, and Lukas Kauer, "Health Plan Payment in Switzerland," in "Risk Adjustment, Risk Sharing and Premium Regulation in Health Insurance Markets," Elsevier, 2018, pp. 453–489.

Shapiro, Bradley T., "Promoting Wellness or Waste? Evidence from Antidepressant Advertising," *American Economic Journal: Microeconomics*, May 2022, *14* (2), 439–477.

Sinkinson, Michael and Amanda Starc, "Ask Your Doctor? Direct-to-Consumer Advertising of Pharmaceuticals," *The Review of Economic Studies*, March 2019, *86* (2), 836–881.

Socha-Dietrich, Karolina, Chris James, and Agnès Couffinhal, "Reducing ineffective health care spending on pharmaceuticals," Technical Report, OECD, Paris January 2017.

Song, Yan and Douglas Barthold, "The effects of state-level pharmacist regulations on generic substitution of prescription drugs," *Health Economics*, 2018, *27* (11), 1717–1737. _eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/hec.3796.

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

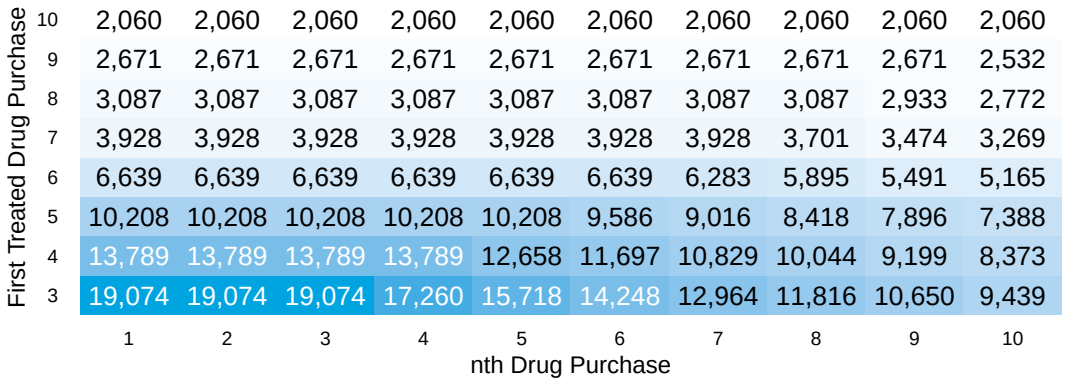
Trottmann, Maria, Mathias Frueh, Harry Telser, and Oliver Reich, "Physician drug dispensing in Switzerland: association on health care expenditures and utilization," *BMC Health Services Research*, July 2016, *16* (1), 238.

A Appendix One

Appendix Table A1: Drug Groups Included in Generics Mailing Campaign

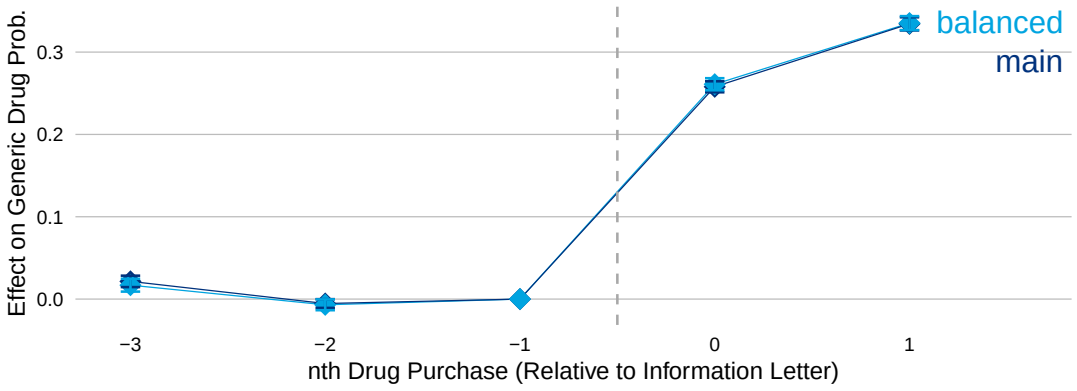
Drug group	Letters sent	First letter
Atorvastatin	4,751	2012
Candesartan	6,187	2013
Celecoxib	673	2015
Clopidogrel	6,320	2010
Duloxetin	1,214	2017
Esomeprazol	3,560	2015
Ezetimib	558	2018
Lansoprazol	1,217	2011
Gliclazid	2,364	2015
Ibandronic acid	367	2015
Irbesartan	4,717	2013
Losartan	2,066	2011
Metoprolol	4,441	2011
Pantoprazol	8,255	2010
Pramipexol	1,272	2011
Pregabalin	1,088	2017
Rosuvastatin	4,234	2017
Valsartan	3,423	2012
Venlafaxin	3,623	2010
Zolmitriptan	1,126	2013

Notes: Drug group denotes the substances for which the mailing was ever active. Letters sent corresponds to the total number of letters sent for the respective drug group. Finally, first letter denotes the first year in which the mailing campaign was active for the respective drug group.



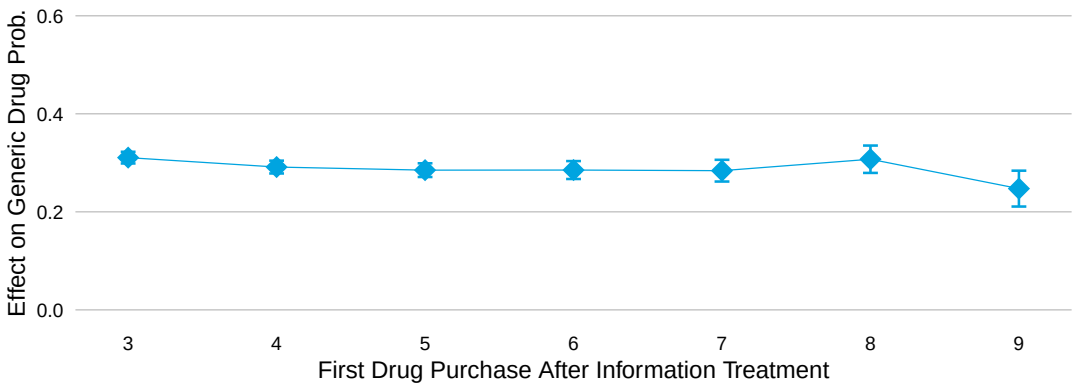
Appendix Figure A1: Distribution of Observations by nth Drug Purchases and First Treated Drug Purchase Groups

Notes: This figure shows the total number of observations by first treated drug purchase g at purchase c. The sample is balanced within the pre-treatment period ($c \leq g$) but not necessarily in the post-treatment period. This occurs due to the sample restrictions as illustrated in Section 3.2.



Appendix Figure A2: Main estimates vs. estimates based on balanced panel (absolute coefficients)

Notes: As a robustness-check, we directly compare the event study estimates of our main specification in Figure 1 to those using a balanced panel. The estimates are very similar irrespective of allowing for a balanced or unbalanced panel.



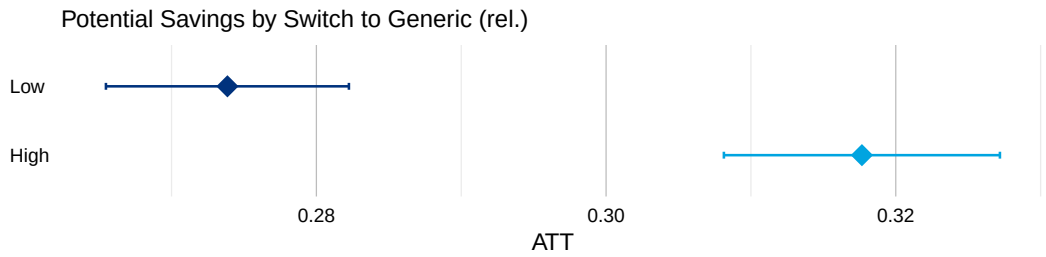
Appendix Figure A3: Effect of Information on Generic Substitution Across First Purchase Treated Groups

Notes: This figure compares the aggregated ATTs of all cohorts g. For the aggregation all ATTs up to $e = 2$ are considered where available. Because later treated cohorts, $g \in \{8, 9\}$ are only observed until $e = 1$ and $e = 0$, respectively, for these cohorts the aggregation is based on fewer post-treatment periods. The different cohorts are depicted on the x-axis.

Appendix Table A2: Full Main Difference-in-Differences Results

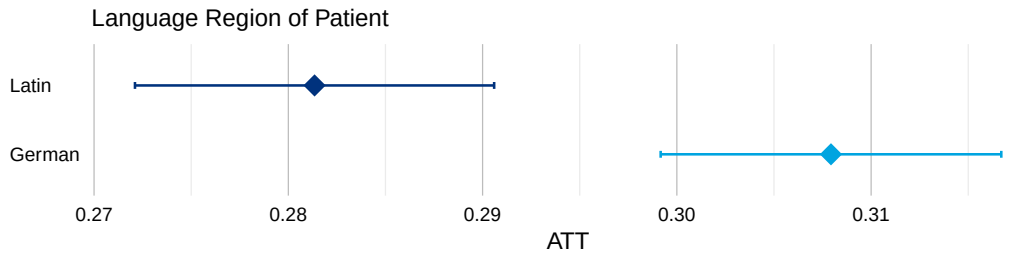
Term	Estimate	Standard Error
ATT(3,1)	-0.026	0.003
ATT(3,2)	0.000	
ATT(3,3)	0.273	0.004
ATT(3,4)	0.348	0.004
ATT(3,5)	0.383	0.005
ATT(3,6)	0.421	0.005
ATT(3,7)	0.460	0.006
ATT(3,8)	0.485	0.006
ATT(3,9)	0.525	0.010
ATT(4,1)	0.004	0.004
ATT(4,2)	-0.001	0.003
ATT(4,3)	0.000	
ATT(4,4)	0.254	0.004
ATT(4,5)	0.329	0.005
ATT(4,6)	0.374	0.005
ATT(4,7)	0.411	0.006
ATT(4,8)	0.443	0.007
ATT(4,9)	0.485	0.009
ATT(5,1)	0.029	0.004
ATT(5,2)	0.026	0.004
ATT(5,3)	-0.000	0.004
ATT(5,4)	0.000	
ATT(5,5)	0.249	0.005
ATT(5,6)	0.322	0.005
ATT(5,7)	0.368	0.006
ATT(5,8)	0.401	0.007
ATT(5,9)	0.445	0.010
ATT(6,1)	0.032	0.005
ATT(6,2)	0.025	0.005
ATT(6,3)	0.015	0.005
ATT(6,4)	0.000	0.005
ATT(6,5)	0.000	
ATT(6,6)	0.242	0.006
ATT(6,7)	0.329	0.007
ATT(6,8)	0.367	0.008
ATT(6,9)	0.408	0.010
ATT(7,1)	0.053	0.008
ATT(7,2)	0.055	0.007
ATT(7,3)	0.063	0.008
ATT(7,4)	0.059	0.007
ATT(7,5)	0.032	0.006
ATT(7,6)	0.000	
ATT(7,7)	0.252	0.008
ATT(7,8)	0.316	0.009
ATT(7,9)	0.366	0.012
ATT(8,1)	0.056	0.008
ATT(8,2)	0.059	0.008
ATT(8,3)	0.059	0.008
ATT(8,4)	0.055	0.008
ATT(8,5)	0.046	0.007
ATT(8,6)	0.023	0.007
ATT(8,7)	0.000	
ATT(8,8)	0.261	0.009
ATT(8,9)	0.353	0.011
ATT(9,1)	0.038	0.010
ATT(9,2)	0.024	0.010
ATT(9,3)	0.025	0.011
ATT(9,4)	0.034	0.010
ATT(9,5)	0.038	0.010
ATT(9,6)	0.028	0.010
ATT(9,7)	-0.001	0.010
ATT(9,8)	0.000	
ATT(9,9)	0.247	0.011

Notes: This table shows the ATT(g, c) estimates and the corresponding standard errors for each cohort g at each purchase c. If c ¡ $g-1$, the estimates correspond to a test for pre-treatment trends. ATT(g, $g-1$) corresponds to the reference purchase, i.e., the last untreated purchase.



Appendix Figure A4: Effect across savings potential (relative) of switching to from brand to the cheapest generic alternative

Notes: This figure shows the aggregated ATT by savings potential. Specifically, savings are determined by comparing the difference between the costs of the most expensive drug and the cheapest alternative drug within the same substitution group, relative to the price of the most expensive drug. Patients are divided into subgroups depending on whether the potential relative savings are above or below the median potential savings of all substitution groups.



Appendix Figure A5: Effect across language regions

Notes: This figure shows the aggregated ATTs by language region of the patients. Patients living in the French- or Italian-speaking part of Switzerland belong to the "Latin" group. Patients that move between language regions within the observation period are omitted from the estimation.

CSS
Communications
Tribschenstrasse 21
Mailbox 2568
6002 Lucerne

Telephone 0844 277 XXX
Telefax 058 277 XX XX
xxx@css.ch

css.ch

CH-6002
Lucerne

4XX-37-2XX / DCK
POST CH AG

Mr.
John Doe
Example Street 1
9999 Example Town

Lucerne, xx.xx.20xx

Generic drugs - Same effect, lower costs!

Dear Mr. Doe

Is there a less expensive alternative to my medications? Generic drugs could be an answer to this question.

Generic drugs are imitation products with the same active ingredient and dosage that are just as effective as the brand version of the drug and meet the same standards. The Swiss Agency for Therapeutic Products, Swissmedic, monitors this.

In the meanwhile, imitation products for the brand drug Crestor have come to market in Switzerland. The following generic versions are available:

Crestastatin, Rosuvastatin Axapharm, Rosuvastatin Mepha, Rosuvastatin NOBEL, Rosuvastatin Sandoz, Rosuvastatin Spirig HC, Rosuvastatin Viatris, Rosuvastatin Xiromed, Rosuvastatin Zentiva, Rosuvastax

Some of these alternatives are up to 61% less expensive. At your next drug purchase ask your physician or pharmacist about the appropriate generic for your branded drug --- or whether you should ahere to the brand. As attractive as generic drugs are, there are also limits in their usage.

If have you have any questions about this letter, we are happy to take time for you.

Kind regards,
CSS

First Name Last Name

Head of Communications Medical Claims
Member of Management

First Name Last Name

Domain Expert Communications Medical Claims

Appendix Figure A6: Informational letter for the brand drug *Crestor* (Rosuvastatin)

Notes: As there was no English version of the mailing campaign, the example above represents a translation of the default German letter for the purposes of this paper. No further changes were made, beyond removing the personal information of the health insurance employees responsible for the campaign.