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Physicians prescribing originals causes welfare losses☆

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HIGHLIGHTS

- We analyze 319,000 patient choices among medically equivalent drugs at pharmacies.
- We control for patients' consumption experiences, fixed preferences, and prices.
- Patients prefer choosing the prescribed product, especially when it is an original.
- Patients also want to choose the cheapest product, as advised by pharmacists.
- Therefore, physicians prescribing more expensive products cause welfare losses.

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ABSTRACT

We analyze 319,000 choices of medically equivalent drugs at Swedish pharmacies. The results show that patients dislike substitutions for the prescribed product and that this effect is larger when the prescribed product is an original. At the same time, patients have strong preferences to buy the cheapest generic product. This implies that patients in most cases buy the cheapest generic product and experience welfare losses when the physician has prescribed another product.

1. Introduction

To keep costs down for off-patent pharmaceuticals, substitution policies have been introduced in many European countries (Dylst et al., 2012) and all American states (Vivian, 2008). These policies give pharmacists either a right or an obligation to suggest that patients substitute a cheaper medically equivalent alternative for the prescribed product.

In this paper, we study patients' choices at pharmacies using a dataset that identifies both the prescribed and the dispensed product. To the best of our knowledge, this paper is the first to estimate how physicians' choices among medically equivalent products affect the dispensing probabilities of individual products.

Previous studies analyzing determinants of which medically equivalent pharmaceutical products are dispensed include Hollis (2002), Mott and Cline (2002), Dalen et al. (2011), Granlund and Rudholm (2012), Brekke et al. (2013), Granlund (2015) and Skipper and Vejlin (2015). These studies have shown that order of entry, physician and patient characteristics, prices, and pharmacy incentives are important determinants. Like us, Granlund and Rudholm (2012) use a dataset that identifies both the prescribed and the dispensed product. They found that patients are more likely to oppose substitution if the prescribed product is an original product instead of a generic. However, they did not study the probabilities that different products were bought and did not control for heterogeneity in preferences and purchase histories.

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The results of this paper show that patients prefer to buy the prescribed product, but also to buy the cheapest product, which is the product the pharmacists recommend. When the physician has prescribed another product than the cheapest one, patients experience welfare losses. This implies that physicians' choices of products[1] matter when patients are free to choose among medically equivalent products at the pharmacy.

2. The generic market

All Swedish residents are covered by a mandatory and uniform pharmaceutical benefit scheme in which reference prices are set equal to the price of the cheapest substitute product. Only products within narrowly defined exchange groups that have the same combination of active substance, form of administration, strength and nearly identical packet size[2] are considered substitutes. Patients pay a share of the reference price, which decreases the patient's accumulated expenditure within the benefit scheme during a 12-month period, plus the entire price difference if they choose a more expensive product.

The generic substitution regulation requires pharmacy personnel to suggest that patients substitute the prescribed pharmaceutical product with the cheapest available substitute, the "product of the month". The obligation is waived if the physician indicated on the prescription that no substitution should be allowed for medical reasons or if the pharmacist has reason to believe that the patient would be adversely affected, e.g., because the low-cost alternative has a package that is difficult for some patients to open. Physicians and pharmacies only oppose substitution in a few percentages of cases, and in these cases, the entire cost of the product is included in the benefit scheme.

Firms wanting their products to be included in the pharmaceutical benefit scheme must submit their price bids for month m to the Dental and Pharmaceutical Benefits Agency (DPBA) two months ahead. The DPBA most often approves prices not exceeding the highest existing price within the exchange group, but the agency does not approve prices that are too high relative to therapeutic alternatives. The DPBA determines pharmacies' margins, and both wholesale and retail prices are uniform across all pharmacies in Sweden. Of the generic products, 38% have a different price than during the preceding month (Granlund and Bergman, 2017). Price changes of generics are often large, and many generic firms seem to apply mixed pricing strategies to make it hard for competitors to predict their prices.

3. Data

The data we use come from a dataset provided by the County Council in Västerbotten, Sweden, that includes all prescriptions filled by adult inhabitants of the county of Västerbotten from September 2010 to December 2013. Since the whole dataset contains too many choices (i.e., products) to make estimation feasible, we only include the four exchange groups with the largest number of observations. Table 1 describes these exchange groups.

The variable *NotP* is a dummy variable taking the value 1 for products that are not the prescribed one and zero for prescribed products. Table 1 shows that 74%–93% buy other products than the prescribed one. GM_{jt} is a dummy variable assuming the value 1 for the product of the month, i.e., the cheapest product that is also the product the pharmacy personnel should recommend. Table 1 shows that about 80% of patients buy the product of the month, but that it seldom is prescribed. *Price* is defined as the out-of-pocket price in Swedish crowns (SEK) per tablet (or per capsule).[3]

Lastly, Table 1 shows that an original product is dispensed less often than it is prescribed. Note that two of the exchange groups do not include the products of the former patent holder. The original products Losec (omeprazole) and Zocor (simvastatin) were excluded from the benefit scheme in 2006 and 2009, respectively, since the DPBA found their prices to be too high relative to the therapeutic alternatives.

4. Modeling

We index individual by i, product by j, and time by t and assume the following indirect utility function:

$$U_{ijt} = \mu NotP_{ijt} + \theta GM_{jt} + \beta Price_{ijt} + \gamma StateD\left(H_{ijm}, \delta\right) + \alpha_{ij} + e_{ijt}.$$

For the two exchange groups including the originals, we also estimate a specification that allows the utility effect of buying a product that is not prescribed to depend on whether the prescribed product is an original (μ_O) or a generic (μ_G).

The first three variables of the indirect utility function are described in the previous section. $StateD\left(H_{ijm}, \delta\right)$ is a state dependence variable commonly used in marketing studies (see, e.g., Ching et al., 2009; Guadagni and Little, 1983). Here, H_{ijm} is patient i's purchase history for product j prior to month m, and δ is the exponential smoothing parameter; explicitly, we write $StateD_{ijm} = \delta StateD_{ij,m-1} + (1-\delta)\, d_{ij,m-1}$, where $d_{ij,m-1}$ is an indicator that equals one if the patient bought product j in month $m-1$ and equals zero otherwise. We control for $StateD\left(H_{ijm}, \delta\right)$ to avoid the estimator for μ being affected by a patient's consumption history affecting both the physician's and the patient's current choices. Similarly, we include product-patient-specific intercepts, α_{ij}, to avoid the estimator for μ being affected by patient-specific unobserved tastes affecting both the physician's and the patient's choices. Because $\boldsymbol{\alpha}_i$ contains product-individual specific parameters, we control for, e.g., that many patients attach a higher value to an original drug compared to a generic drug. The vector $\boldsymbol{\alpha}_i$ is assumed to be distributed according to a multivariate normal distribution. Hence, the empirical model is flexible enough to capture the correlations of patients' preferences across different products. Lastly, e_{ijt} is an i.i.d extreme value term capturing the idiosyncratic taste of patient i for product j at time t.

We assume revealed preference, i.e., if the patient is faced with products A and B, he or she chooses product A if the utility he or she derives from the choice of A is larger than that of product B. Given this assumption, we can identify the parameters of the indirect utility functions by estimating the probabilities of choosing a specific product as a function of the characteristics of this product and the other products' characteristics within the exchange group. We do this by maximum simulated likelihood (SML), which is an extension of maximum likelihood that allows us to control for individual-specific heterogeneity in consumers' preferences.[4] In the SML-estimation procedure, there is no closed form for the choice probabilities, so we integrate over the distribution of $\boldsymbol{\alpha}_i$. For each $\boldsymbol{\alpha}_i$, we use 200 draws to simulate the integrals by Monte Carlo methods (see, e.g., McFadden, 1989).[5]

[1] Physicians' choices among medically equivalent pharmaceutical products have been studied by, e.g., Hellerstein (1998), Coscelli (2000), Lundin (2000), Liu et al. (2009) and Iizuka (2012).

[2] Packet size is allowed to vary slightly; for example, substitution will be made from a 30-pill package to a package in the 28–32-pill range.

[3] We do not observe the prices of each product each month. Missing prices occur if the product is not sold that month to any consumer in the data. This might be caused by an unusually high price or by the product not being available at the pharmacies that month. We therefore impute the missing prices by the maximum price observed for that product over the whole sample period. Using mean values instead gives similar results.

[4] See, e.g., Harris and Keane (1998) and Ching et al. (2009). The general estimation procedure is described pedagogically in Train (2009, ch. 6).

[5] To deal with the initial conditions problem (Heckman, 1981) caused by not observing choices before $m = 1$, we hold out four months from the estimation