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Price competition in pharmaceuticals – Evidence from 1303 Swedish markets☆

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ABSTRACT

We study the short- and long-term price effects of the number of competing firms, using panel-data on 1303 distinct pharmaceutical markets for 78 months within a reference-price system. We use actual transaction prices in an institutional setting with little scope for non-price competition and where simultaneity problems can be addressed effectively. In the long term, the price of generics is found to decrease by 81% when the number of firms selling generics with the same strength, form and similar package size is increased from 1 to 10. Nearly only competition at this fine-grained level matters; the effect of firms selling other products with the same active substance, but with different package size, form, or strength, is only a tenths as large. Half of the price reductions take place immediately and 70% within three months. Also, prices of originals are found to react to competition, but far less and much slower.

1. Introduction

An important economic question is how the number of sellers affects prices. Many studies have attempted to determine this but very few of them are able to distinguish between short- and long-term effects. Weiss (1989) summarizes the results of studies in the old industrial-economics tradition. Mazzeo (2002), Davis (2005) and Singh and Zhu (2008) are more recent examples.

Within the context of a reference-price system for off-patent prescription drugs, where the reference price is set equal to the lowest price, i.e., so-called internal reference pricing, we find a strong price effect of the number of competing sellers. The setting, with clear and explicit market rules, allows us to make causal interpretations and also to estimate dynamic pricing models, hence enabling estimates of the speed of the price response.

We relate to a substantial empirical literature on pharmaceutical pricing, that addresses the effect of the number of generic firms on prices. Estimates by Caves et al. (1991), Frank and Salkever (1997), and Wiggins and Maness (2004), who all use US data, suggest that increasing the number of actual generic suppliers from 1 to 10 reduces prices of generics by about 50%. Reiffen and Ward (2005) estimate the effect to be slightly smaller, but Regan (2008), also using US data, and Brekke et al. (2011), who use Norwegian data, find no significant negative effects.

Danzon and Chao (2000) estimated that increasing the number of products per molecule from 1 to 10 was associated with a price reduction of 69% in the US and somewhat less in Canada, UK, and Germany, but they found no significant effects for France, Italy and Japan. That Danzon and Chau found so large associations for some countries, despite being unable to address endogeneity concerns,

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might be because they used cross-sectional data and hence estimated long-run associations. Berndt and Aitken (2011) report data suggesting that the effect can be even larger in the US. They report that, for a sample of top-selling generic molecules that were still in the market 25 months after the initial entry, the average generic price had then fallen by about 94%, while the average number of generic firms had increased to 12.

Previous results regarding the effect on prices of originals are mixed. Frank and Salkever and Regan found that prices of originals increased in response to generic entry, while Caves et al., Wiggins and Maness, Saha et al. (2006), who also use US data, and Stargardt (2011), who uses German data, found negative price effects of more generic competition. Based on US data, Ching (2010a, b) reports mixed results; that some brand-name prices increase and a few decrease, as the number of generics becomes higher.

A central aim of this article is to examine how the number of firms in the market affects the prices of individual pharmaceutical products in a setting with well-defined markets and few non-price competitive actions available to the firms. Advertising directed towards consumers, for example, is banned by law for prescription pharmaceuticals in Sweden and the physical and financial conditions for delivery and payment are fixed by the market regulator.

Our study is also relevant for the literature on reference pricing. Following the introduction of the first reference-price system in Germany in 1989, a large number of such systems have been introduced, including the 1993 Swedish system, subsequently reformed in 2002. Reference pricing aims to control costs indirectly, by making demand more elastic, rather than through direct price regulation (Brekke et al., 2007). A more elastic demand is achieved by requiring patients to pay the difference between the price of the subscribed product and the reference price for the cluster to which it belongs. The reference price can be, e.g., the lowest, second-lowest or average price within the cluster or a certain fraction of the original's price (internal reference pricing) or the average price of the same product in a group of countries (external reference pricing).

Virtually all studies confirm that the introduction of reference pricing results in lower prices in the short run,[1] but less is known about their long-run effects (Galizzi et al., 2011) and about how the design of the system influences its success (Kaiser and Mendez, 2015). Concerns have been raised that reference pricing will only have a transitory effect. Our research design does not allow us to evaluate reference pricing per se, but we do observe strong and sustained effects of competition within such a system. To some extent this may be due to the narrowly defined reference clusters and to some extend due to the reference price being set in a monthly bidding contest that confers substantial benefits to the low bidder.

Unlike the pharmaceutical-pricing studies mentioned above, we estimate dynamic models, allowing us to study the speed of adjustment and distinguishing between short- and long-term effects. Several mechanisms make it likely that the short-term effects are smaller than the long-term effects. For example, for an incumbent firm it might be easier to achieve a collusive equilibrium by initially maintaining the pre-entrance price so as to allow entering firms to adjust their prices, rather than reducing the price at entry and then attempt to achieve a coordinated price increase. Another reason is that, when a firm exits, each remaining firm gains by being the last to increase its price. Companies may also have limited abilities to predict what the new equilibrium price will be, which makes them adjust gradually to the new equilibrium. Lastly, for originals, market-specific rules can result in slow adjustment. In the Swedish pharmaceutical market there is a dynamic price-cap that may prevent a product that is already the most expensive among substitutes to increase its price if it wants to remain within the reimbursement system. Hence, for originals a price-cut that in retrospect is found to be too large cannot always be reversed.

By studying the speed of adjustment, we relate to the large experimental (and theoretical) literature on whether and how fast equilibrium is reached in one-sided and two-sided auctions (see e.g. Smith, 1962; Plott and George, 1992; List, 2003; Crockett et al., 2011). The Swedish generics market offers a large number of recurring high-value auctions and provides an opportunity to learn about the behavior of professional bidders. Knowing the speed of adjustment when the number of firms changes is also important when forecasting expenditures for budget purposes and when evaluating reforms in the market.

Applying a dynamic model to monthly data and using the fact that the rules require firms to submit their price bids two months in advance allow us to identify the causal effects of the number of firms. The reason is that the monthly data and the bidding rules effectively solve the simultaneity problem that often troubles price–concentration studies – under the assumption that firms cannot predict future price shocks when submitting their bids. That the simultaneity problem is solved this way enables us to estimate the effect of competition, using indicator variables for the number of firms. To our knowledge, this has previously been done only by Reiffen and Ward (2005) and Regan (2008) using a few hundred observations. We find that the effect of additional firms is large, even then the initial number of firms is already large.

We use a dataset provided by IMS Sweden that covers all off-patent prescription pharmaceuticals sold in the Swedish reimbursement system at Swedish pharmacies from January 2006 through June 2012. The dataset contains a total of 168,188 observations of prices and total national sales. One advantage with the data is that the prices are actual transaction prices, not list prices, as Swedish law forbids pharmaceutical firms to give pharmacies discounts or rebates for pharmaceuticals with generic alternatives.[2] Another is that the observations are at the product level[3], meaning that the composition effects caused by, e.g., changes in the distribution over package sizes will not bias the results. The observations are related to 4 730 different products in 1 303 exchange groups. The exchange groups consist of products with the same combination of active substance, form of administration, strength, and packet size. At pharmacies, consumers can choose among products (brands) within the exchange group of the prescribed product and are incentivized, via reference pricing, to choose the lowest-priced product.

Comparing exchange groups within substances a given month, the data reveals that the price per defined daily dose is more than twice as large in the exchange groups with the lowest number of firms compared to the one with the most firms. From a policy perspective it is important to study to what extent this reflects a causal effect of the number of firms, since this can determine if it is profitable to, e.g., reduce the administrative fees in order to increase the number of active firms in small exchange groups.

This paper relates to Bergman et al. (2017) which used part of the data used in this study to investigate how changing the market share for the lowest bidder affects the cost per defined dose. That study also analyzed the effect of the number of firms, but instead of having the price of individual products as the dependent variable, the dependent variable was cost per defined dose

[1] For surveys, see Galizzi et al. (2011), Puig-Junoy (2010), and Dylst et al. (2011).

[2] The last few years, some pharmaceutical firms have given the county councils, which employ most physicians in Sweden, chargebacks for some new on-patent drugs, but this does not affect the off-patent drugs under our study-period.

[3] A product is defined as a unique combination of substance, form of administration, strength and package size, sold by a specific firm.