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Pricing of drugs with heterogeneous health insurance coverage

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ABSTRACT

In this paper, we examine the role of insurance coverage in explaining the generic competition paradox in a two-stage game involving a single producer of brand-name drugs and n quantity-competing producers of generic drugs. Independently of brand loyalty, which some studies rely upon to explain the paradox, we show that heterogeneity in insurance coverage may result in higher prices of brand-name drugs following generic entry. With market segmentation based on insurance coverage present in both the pre- and post-entry stages, the paradox can arise when the two types of drugs are highly substitutable and the market is quite profitable but does not have to arise when the two types of drugs are highly differentiated. However, with market segmentation occurring only after generic entry, the paradox can arise when the two types of drugs are weakly substitutable, provided, however, that the industry is not very profitable. In both cases, that is, when market segmentation is present in the pre-entry stage and when it is not, the paradox becomes more likely to arise as the market expands and/or insurance companies decrease deductibles applied on the purchase of generic drugs.

1. Introduction

The development and growth of the generic pharmaceutical industry over the past 25 years has come in response to rising healthcare costs. In 2004, healthcare costs represented 15.3 percent of GDP in the United States, the highest share among OECD countries, followed by Switzerland (11.6 percent), Germany (10.9 percent), and France (10.5 percent), all above the OECD average of 8.9 percent (OECD, 2007). Private expenditures per capita were also the highest in the United States, more than double the private expenditures per capita of any other OECD country. For all OECD countries, the rate of growth of health spending per capita increased over the period 1999–2004 by more than 5 percent per year. With pharmaceutical expenditures representing 10–25 percent of health expenditures (OECD), many countries have attempted to promote the use of generic drugs in a variety of ways in order to keep healthcare costs down while maintaining or even increasing accessibility to pharmaceuticals and retaining incentives to invest in innovation and research and development.

In 1984, the Drug Price Competition and Patent Term Restoration Act, also known as the Waxman–Hatch Act, was introduced in the U.S. in order to improve generic competition by lowering barriers to entry for generic drugs and to increase patent terms for new drugs delayed by complicated and time-consuming approval procedures of the U.S. Food and Drug Administration (FDA), the agency responsible for the safety and efficacy of drugs. Under this legislation, (duplicative) testing for generic drugs was eliminated and replaced by the requirement that an Abbreviated New Drug Application (ANDA) be submitted by generic entrants demonstrating the equivalence between their products and the original (brand-name) drugs. Not surprisingly, the entry of generic drugs into the pharmaceutical market intensified dramatically following the introduction of the Waxman–Hatch Act, and as a result of the expiration of patents on many high-sales-volume brand-name drugs (Frank and Salkever, 1997). In response to the increased market share of generic drugs and lower prices of pharmaceuticals overall, the prices of brand-name drugs did not fall consistently with the predictions of traditional market entry models; instead, they were often observed to increase. This phenomenon is often referred to as the generic competition paradox, or GCP (Scherer, 1993).

The first evidence of the Wagner and Duffy (1988) who found substantial price increases associated with entry despite significant decreases in generic prices among top selling name brand drugs. Several other instances of support for the paradox were provided in subsequent studies, including those by Grabowski and Vernon (1992), Frank and Salkever (1997), Perloff et al. (1995), and, to a

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lesser extent, Caves et al. (1991). Grabowski and Vernon, using data on 18 major drugs in the mid-1980s, showed that prices for name brands increased on average by 7 percent after entry and continued to increase in the following year. Frank and Salkever utilized data on the patent expiration of 45 drugs facing competition for the first time between 1984 and 1987, and found that, although significant market share was lost upon entry by brand-name producers, the price of their product generally increased. Similarly, Perloff et al. showed brand-name price increases using data from the mid-1980s from the U.S. anti-ulcer drug market. Although Caves et al. did not observe price increases in their study of 30 drugs between 1976 and 1987, they found prices to decrease by only small amounts following entry (2 percent on patent loss, although this loss increased with the number of entrants) and by far less than the price decrease experienced by entrants. In other studies, including the work by Wiggins and Maness (2004) on 98 anti-infectives from 1984 to 1990, no evidence in support of the paradox was detected.

Traditional oligopolistic models of entry suggest that the increased competition caused by generic entry should drive prices down for all firms, as illustrated by a move from monopoly to duopoly with homogeneous goods. While most, if not all, models attempting to explain the paradox would suggest that *average* prices fall after entry, the standard models do not explain why the price charged by the incumbent firm could increase after entry. Several explanations have been proposed to theoretically support the empirical finding that prices of brand-name drugs increase after entry. For example, but outside of the realm of the pharmaceutical industry, models of entry-induced price increases in oligopolistic or monopolistically competitive markets, including those by Satterthwaite (1979), Salop (1979), Rosenthal (1980), suggest that economies of scale or specific demand curve changes can lead to post-entry price increases.[1] Due to the nature of pharmaceutical production, economies of scale are not typically significant and therefore this is not a likely explanation for the paradox. However, several papers employ changes in the elasticity of demand to explain the paradox, including the brand-loyalty models of Caves et al. (1991), Grabowski and Vernon (1992), Frank and Salkever (1997), and Kamien and Zang (1999).[2] In these models, *exogenous* segmentation of the market occurs upon entry, as one group of consumers is price sensitive while another is not.[3] The segmentation is exogenous in the sense that the individual groups exist separately in the market prior to entry but the brand-name producer is not permitted to choose whether or not it wants to serve only one group prior to entry, and the size of each group remains constant before and after entry.

Other studies attempting to explain the paradox introduce price stickiness into models due to imperfectly informed doctors (Bhattacharya and Vogt, 2003), product differentiation with collusion or price competition (Perloff et al., 1995), or quality differences (Berndt et al., 1993; Griliches and Cockbrun, 1994). Bhattacharya and Vogt argue that doctors' stock of knowledge about the presence and efficacy of new generics evolves slowly and is manipulated by producers through advertising. Perloff et al. show that the paradox can occur when products are significantly differentiated in product space. Pre-entry, the firm lowers its price to serve segments of the market located far away from its product in its characteristics, but increases its price once entry occurs and those consumers switch to the entrant's product. Product location is exogenous, and the paradox is not possible for cases in which the entrant's product and the incumbent's product are closely related (little product differentiation). Berndt et al. and Griliches and Cockbrun have that price increases are generated by quality improvements, and that prices increase over the life of a product (although increase more slowly post-entry).

In this paper, we combine some of the features of the models of previous studies, including product differentiation and brand loyalty, but focus on the role of insurance coverage in the segmentation of the market. Specifically, we examine the endogenous segmentation of the market by the brand-name producer, both before and after entry, to determine whether or not insurance coverage can explain the paradox, and its relation to the other theories of the literature.

The relevance of insurance in pricing decisions has empirical support. Hellerstein (1994), for example, using prescription data from the eight largest therapeutic drug classes, describes how most individual doctors prescribe both brand-name and generic drugs (suggesting that a lack of awareness or knowledge is not driving the prescription decision). Furthermore, doctors with higher fractions of Medicaid, Medicare, HMO, and privately insured patients are more likely to prescribe generics, although the links are not particularly strong (or even negative) for certain drug classes. Pavcnik (2002) suggests that brand-name pricing is very sensitive to out-of-pocket expenditures, and estimates, using data from Germany, that the price adjustment to an exogenous change in insurance coverage ranges between 10 percent and 26 percent. In a cross-country study, Danzon and Chao (2000) show that the effect of generic competition on brand-name prices depends on the insurance coverage and pricing regime, and conclude that countries with fee pricing (like the U.S.) tend to experience large decreases but countries with strict reimbursement regulation and insurance (like France, Italy, and Japan) tend to experience price increases.[4]

In the present analysis, we construct a model in which consumers differ on the basis of coverage, and the brand-name producer can choose, through its price for the brand-name drug and taking into account the impact of its own decisions on generic pricing, which consumers it wants to target and which consumers it wants to leave out of the market (pre-entry) or to the generic producers (post-entry).[5] The inclusion of a parameter, q, into the utility function describing consumers' preferences, which captures the perceived quality differential between brand-name and generic drugs, allows for a separation between the price effects of brand loyalty as reflected in q and the price effects of segmentation induced by insurance coverage heterogeneity. We thus derive conditions under which the GCP occurs in instances in which brand loyalty (or the perceived quality differential) alone does not give

[1] Davis et al. (2004) suggest that differentiation and segmentation may lead to price increases after entry beyond drugs to other products such as Microsoft's Windows.

[2] Kamien and Zang focus on the introduction of generics by brand-name firms prior to entry rather than on the segmentation by brand loyalty itself.

[3] Exogenous segmentation by physicians based on insurance coverage is recently considered by Ferrara and Kong (2008). In addition to assuming that the market is exogenously segmented (following the entry of generic drugs) between consumers with more coverage who buy both types of drugs and consumers with less coverage who buy only generic drugs, this study does not allow for quality considerations as captured by brand loyalty. Furthermore, in the absence of segmentation prior to generic entry, the study cannot separate between the effect of market segmentation per se and the effect of generic entry through market segmentation. In a sense, the GCP is built into the model through imposed upon segmentation post generic entry. In fact, a result of the study is that the GCP is more likely to result as the market share of consumers with better insurance decreases.

[4] Other papers, such as that by Anis (1992), focus on the effectiveness of a reimbursement regime as a solution to the principal-agent problem in doctors' prescription decisions.

[5] The empirical evidence on the GCP comes from the U.S. where there is heterogeneity in co-payments. Given our objective in this paper, that is, to theoretically explain why the GCP can and does arise, our assumption that consumers differ in insurance coverage (i.e., co-payments) is most applicable.