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The Questionable Economic Case for Value-Based Drug Pricing in Market Health Systems

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ABSTRACT

This article investigates the economic theory and interpretation of the concept of “value-based pricing” for new breakthrough drugs with no close substitutes in a context (such as the United States) in which a drug firm with market power sells its product to various buyers. The interpretation is different from that in a country that evaluates medicines for a single public health insurance plan or a set of heavily regulated plans. It is shown that there will not ordinarily be a single value-based price but rather a schedule of prices with different volumes of buyers at each price. Hence, it is incorrect to term a particular price the value-based price, or to argue that the profit-maximizing monopoly price is too high relative to some hypothesized

value-based price. When effectiveness of treatment or value of health is heterogeneous, the profit-maximizing price can be higher than that associated with assumed values of quality-adjusted life-years. If the firm sets a price higher than the value-based price for a set of potential buyers, the optimal strategy of the buyers is to decline to purchase that drug. The profit-maximizing price will come closer to a unique value-based price if demand is less heterogeneous.

Keywords: health care markets, insurance, pharmaceuticals, value-based pricing.

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Introduction

The concept of value-based pricing was originally developed for settings in which a single health insurer or health payer (such as the UK National Health Service [NHS]) is trying to determine whether to cover a novel drug at all, and, if so, at what price [1]. Use of the concept in the United States has since taken several modified forms [2]. We first explain the NHS version, then discuss its variants, and finally use the essential concept of value-based pricing to comment on some recent uses of the term in the US setting in which there is no single insurer/payer but multiple competitive insurers proposing or willing to pay different prices for the same drug. We argue that, among several differences, a key distinguishing feature of the US setting is the need to pay attention to *unobservable heterogeneity* in patient values for treatments. Our attention is limited to price determinations only for new drugs with patent protection or regulatory exclusion of competition, sold to private insurance firms or individuals, and does not deal with other “value-based” frameworks.

To be clear, when we refer to value-based pricing, we are referring to the neoclassical economic concept that, at the margin, buyer valuations (willingness to pay) equal the price they do pay. We are not referring to the usage of the term that typically encompasses fairness, equity, or political considerations. Nor are we claiming that payment of the price set by a

firm with market power, even though it may be value-based, is necessarily or even usually efficient.

The UK process of price setting is essentially a bargaining model. The low end of the bargaining range is the marginal cost of making copies of the drug (because of the requirement that revenue covers variable cost). The high end is the maximum benefit that NHS could achieve rather than going without (i.e., the maximum value of willingness to pay). Within that range there is no obvious way to settle on a fixed point. The NHS adopted a model in which the agreed upon price generally yields a quality-adjusted life-year (QALY) at a cost of at most £20,000 to £30,000, although prices quickly converged on the upper limit and there are now proposals to increase the amount to £50,000.

This capsule summary of bargaining in a single-payer system may be contrasted with what might be expected to happen in a system of multiple health insurers, some larger than others and some covering or attracting different populations than others, as prevails at present in the United States. There is no doubt that insurers or pharmacy benefit managers would rather pay less than pay more. But then we need to discuss a much neglected subject—how the introductory price for a breakthrough drug with no close substitutes might be set by firms that are presumably maximizing profits and that face a number of different buyers, so that the firm is not bargaining with a single entity. The fact that we focus on a novel drug with no close substitutes also rules out

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“tiered pricing.” Many critics say that US prices for new breakthrough products are set in mysterious or illogical ways. Indeed, prices do not seem to display obvious regularities such as a strong correlation with QALYs added, although there is a broad-gauge association of five- and six-figure prices with lifesaving treatments for serious illness.

In public, drug firms generally offer as a rationale for high introductory drug prices either a justification based on high research and development costs or a reference to a (usually rather vague) positive net value from the drug, sometimes backed up by citations to cost-effectiveness and cost-offset studies. They do not claim that they are charging the profit-maximizing price (even if they are). The most one learns is that the firm thinks the drug is cost-effective at the chosen price. Nothing is said about how the price happened to be chosen, nor about the fact that at a lower price it would be even more cost-effective.

The purpose of this article is not to clarify some recent easily misinterpreted uses of the concept of value-based pricing. Instead, we specify a proper interpretation of that concept on the basis of welfare economics. It is not intended to discuss the full set of concepts of value in medicine or of non-drug medical interventions.

The key omission in the conventional discussion is a mention of demand or quantity demanded, in the sense that the amount that would be sold depends on the price charged. The use of cost-effectiveness measures, which average outcomes and values, does not allow for a conventional demand curve, which is based on variation in values. Analyses often do estimate the number of people with the condition the drug could treat, multiply that by the price, and observe both how large the number is and what drug use will do to total medical care spending. But in almost all cases, no attempt is made to describe the amount of the drug that would be sold at prices other than the proposed price.

Policy remedies to this state of affairs propose to derive a value-based price from data on the outcomes, drug prices, and cost offsets associated with the product, along with assumptions about the value of outcome and the desired size or growth rate of total spending. The model for this approach has been proposed by the Institute for Clinical Effectiveness Research (ICER). The application of this model to the breakthrough drug Praluent, which treats stubborn high cholesterol, was much discussed recently [3–6], and will be used in this article. The model comments on a single posted list price and ignores the possibility of discounting or other kinds of differential pricing, and so this article too will not treat the complex topic of price discrimination.

The Economic Model of Price Setting for Patented Products or Services with Seller Market Power

This textbook model describes pricing by a firm with market power facing a heterogeneous market, setting a single monopoly price (so-called simple monopoly). The key assumption for this model is that different buyers (i.e., insurance plans) attract customers with different values of willingness to pay (partially related to income) for health outcomes. In this example, we assume (unrealistically) that there is perfect stratification across plans: all persons who select a given insurer have exactly the same value for health (say, measured in dollars per QALY). There is probably some typical or central tendency in dollars per QALY in the population of all potential insurance buyers; let us say it is \$100,000. Nevertheless, there are people with higher values, although their numbers diminish as the value rises (i.e., the population demand or marginal benefit curve has a negative slope).

Imagine then that we turn these data into a demand curve for the drug, showing at each level of value/price the number of persons in insurance plans whose own value for that drug is that

large or larger. There must be some very high value at which no person (or their insurers) would be willing to pay before prices fall enough so that quantity demanded is positive. The theory of simple monopoly pricing in economics tells us that we need one key set of information—not what is the average, median, modal, or acceptable value of dollars per QALY for the population, rather the demand curve: the *shape of the distribution* of values at different dollar amounts. Note that the revenue and profit-maximizing price (assuming near-zero marginal cost of producing the drug) is not the highest possible price that could be charged at which there would be some buyers, but instead is low enough to attract many (but by no means all) buyers.

Insurance of the conventional fee-for-service type, which pays for any approved drug (now much diminished in importance), adds complexities and distortions to the demand curve. If the insurance pays fee-for-service (with coinsurance) for the drug and the drug must be made available if physicians think it necessary (as in Medicare Part D), the demand curve becomes less elastic and the monopoly price may rise (compared with no insurance) to highly distortive levels, as supported by Garber et al. [7]. Here, we assume instead the increasingly more common and recent version of private sector insurance (and U.S. Department of Veterans Affairs [VA] policy) in which the insurer can refuse to “buy” (put on formulary) the drug at all at high prices and/or can limit its use through previous authorization rules. Then, the demand curve (across plans) is the demand schedule of firms on behalf of their insurers paying full price at the margin. This concept also has some complexities. Because of limits on the number of plans, the demand curve may not be smooth and continuous. But we will assume that there is a reasonable approximation to the private market demand curve.

We know that a profit-maximizing drug firm will choose the price on this schedule when marginal revenue equals marginal cost. Notionally, we can think of the firm beginning with some very high tentative price, and estimating how many buyers it will have at that price. The firm then asks whether the number of new buyers (plans) who might be brought in with a price cut is large enough, relative to the number of buyers at the higher price, to raise total revenue. Less is collected from the former high price payers, but more is collected from the more numerous new payers. The firm compares any increase in total revenue from selling more of the product with the increase in cost on making more of the product. If the former is higher than the latter, it reduces the price and repeats this cycle until the two terms are equal. The price that prevails at that point is the profit-maximizing price.

There are two important properties of a price set in this manner:

1. It is a value-based price for those consumers/insured choosing a plan because they are willing to pay that price. The average value in this set will be higher than the price (because of the negative slope), but the price will equal the value of health added to the consumers who were just willing to be brought in by the price. Note that this proposition does not depend on the degree of market competitiveness or other aspects of how price is set. If buyers take it as given, they equate willingness to pay to it, no matter however it was set.
2. For those consumers with lower values, their plan's optimal strategy is to walk away from the drug offered at that price. Were buyers effectively to pay the price, they would have paid more for the service than it was worth to them and thus been unable to purchase other services that were of greater value to them. Even though they would have purchased more health, they would be worse off.

An implication of this analysis is that there is no logic to the claim that the profit-maximizing drug price was set “too high”

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