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REVIEW

Principles of Economics Crucial to Pharmacy Students' Understanding of the Prescription Drug Market

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Many pharmacy schools have increased the amount of economics coursework to which pharmacy students are exposed in their prepharmacy and pharmacy curriculums. Students obtain competencies aimed at understanding the basic concepts of microeconomic theory, such as supply and demand. However, pharmacy students often have trouble applying these principles to real world pharmaceuticals or healthcare markets. Our objective is to make economics more relevant for pharmacy students. Specifically, we detail and provide pharmacy-relevant examples of the effects of monopoly power, barriers to marketplace entry, regulatory environment, third party insurance, information asymmetry and unanticipated changes in the marketplace on the supply and demand for pharmaceuticals and healthcare services.

Keywords: economics, drug pricing, manufacturing, supply and demand

INTRODUCTION

Most pharmacy schools require introductory level economics coursework prior to or during the didactic portion of the professional curricula. This coursework exposes students to basic concepts in microeconomic theory and applications, such as supply and demand, with the intent of helping students understand economic principles related to goods that are sold in a *market*. Typically, students learn how to predict the price and quantity for the perfectly competitive market for *goods*, which are products that are bought and sold. Advanced concepts related to market conditions, such as *monopoly markets* and *barriers to entry* typically are covered as well. The application of these market principles to pharmaceuticals or healthcare interventions often is missing or reflects a disconnect in the minds of pharmacy students. Pharmacy school curricula often do not bridge the gap to explain why pharmaceuticals and healthcare markets often do not behave in the same manner as perfectly competitive markets. As a result, many pharmacy students do not fully comprehend what makes the markets for drugs different. The objective of this article is to present economic principles in a context that is more relevant to pharmacy and pharmacy students. We provide some pharmacy-specific examples related to economic concepts in pharmaceutical markets. Since pharmacist training includes both clinical and business domains, these concepts will be relevant for students who are interested in administrative types of positions as well as management faculty members who train such students.

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PRINCIPLES OF ECONOMICS WITHIN THE PHARMACEUTICAL INDUSTRY

Prior to examining how principles of economics influence the "market" for pharmacy-related goods (eg, prescriptions) and services (eg, medication therapy management), we suggest beginning with a didactic review of the simple supply and demand for goods sold in a perfectly competitive goods market. The perfectly competitive market provides a baseline reference, against which certain aspects of pharmaceuticals and healthcare goods and services can be compared to typical goods and services.

The Perfectly Competitive Market for "Goods and Services"

Economists typically define a market by examining the quantities of a good demanded and supplied at various price levels. The relationship between the quantity demanded and various prices is called the *demand curve* and is assumed to be a downward sloping curve; in contrast the *supply curve* shows the upward sloping set of points that graphically represents the relationship between prices and the quantity supplied. The point of

intersection of the 2 curves characterizes the market equilibrium defined by a market price and the amount of goods traded. Among the underlying assumptions for the perfectly competitive market structure are: (1) there are a large number of sellers and buyers, of an identical good, all of whom are small relative to the size of the total market; (2) anyone is allowed to enter the market as either a buyer or as a seller; and similarly, buyers and sellers may leave the market without additional "shut down" costs; (3) there is no government intervention; (4) buyers pay the full cost of their purchases; (5) buyers and sellers have perfect information about the market; and (6) there are no external interventions, nor are there any interactions with other markets.

These assumptions imply that sellers and buyers are too small to have any influence on the outcome of the market. They do not have any market power, therefore, both the buyers and sellers are *price takers*. Because all firms are selling an identical good, any firm that decides to charge more than the market price loses all its customers to its competitors. Additionally, firms have no incentive to sell at a price lower than the market price. Thus, a firm may sell as much as it wants at the market price. How much to sell is decided by the firm's cost of production. Firms choose how much of a good to produce based upon their unique cost of production and the market price. Therefore, in the goods market, sellers accept that competitive prices are set by market conditions and choose their output level accordingly, but end up making no profits because their revenue equals their production costs.

Certain aspects of pharmaceuticals and healthcare goods and services are similar to other goods. The Research and Development Corporation (RAND) experiments documented that the response to changes in out-of-pocket payments was greater for goods and services that were not urgent or life threatening and less responsive for hospital care.[1] Other studies document that patients who take medications for chronic illnesses, such as diabetes, reduced their usage when their pharmacy copayment increased.[2,3] These examples show that patients typically are price sensitive and suggest that some aspects of the prescription drug market are similar to the markets for other goods. Specifically, price sensitivity means that consumers purchase fewer health care goods for non-life-threatening conditions when prices increase; however, the purchase of health care goods and services for life-threatening illnesses (eg, inpatient hospital care) does not change substantially with price increases. A review of price sensitivity for health care goods and services describes the properties of a perfectly competitive market and provides a discussion of why these properties typically do not apply to health care.

The Imperfect Market for Drugs

In the real world, a perfectly competitive market rarely exists. One or more assumptions are violated in most markets and certainly this is the case in the pharmaceutical market. In the remainder of this article, we describe key topics that may help pharmacy students, many of whom will pursue community pharmacy careers, understand major factors affecting the determinants of costs and prices in the non-perfectly competitive pharmaceutical and healthcare markets. While many market distortions impact the cost of developing drugs and their market prices, we propose that the following 6 topics be discussed within a lecture in a pharmacy school curriculum: (1) monopoly power, (2) barriers to entry, (3) regulatory environment and the impact on supply and demand, (4) third party insurance, (5) asymmetric information, and (6) short-term shocks to supply and demand of pharmaceuticals.

Monopoly Power. Pharmacists often face questions from patients regarding how the prices of medications are determined and why, in some cases, they are so expensive. Unlike markets for other goods, in the pharmaceutical marketplace there are a limited number of manufacturers (often just one for a particular drug) and the medicines being sold are not identical (homogenous), but rather are differentiated (heterogeneous). The seller's market power for branded drugs arises because (1) there is just a single manufacturer; (2) there is no exact substitute for the medicine being sold; and (3) there is a guarantee via patent protection that no potential competitor may manufacture an identical drug and sell it at a lower price in the short run. As a result, the branded manufacturer is able to make profits.

Since the monopolist is the only seller of a particular medicine, the monopolist determines the price of the medicine. This establishes the monopolist as a *price setter*, permitting prices above the perfectly competitive price by controlling the quantity of medication produced in the marketplace.[4,5] This is in stark contrast to being a *price taker*, and accepting a price established within a perfectly competitive marketplace. The end result is that prices are higher under these market conditions than they would be in a purely competitive marketplace. Even when there are therapeutic substitutes available, the seller of a particular branded drug may exercise some market power, albeit to a lesser extent than when the monopolist has no therapeutic competition.

Barriers to Entry. A number of factors allow a pharmaceutical manufacturer to act as a monopolist, giving the firm strong market power and the ability to set high prices. These factors create barriers to freely entering the pharmaceutical marketplace and limit market access.

Barriers allow firms to obtain higher profits than would be realized in a purely competitive marketplace, but simultaneously provide incentives for introduction of new pharmaceuticals into the marketplace. Three key factors create barriers: (1) patents, (2) first mover market advantage, and (3) economies of scale and high fixed costs.

First, the United States Patent and Trademark Office, an entity of the federal government, independent of the Food and Drug Administration (FDA), grants patent rights or exclusivity as the sole producer of a product for 20 years. For prescription drugs, this prevents sales of generically equivalent products by competitors until the patent expires, providing a significant barrier to marketplace entry. This exclusivity affords monopolistic market power to the innovator firm, enabling it to realize higher profits than would be possible in a purely competitive marketplace with many producers.[4] The innovator firm has the opportunity to recoup research and development investment costs; however, the major rationale for providing patent exclusivity is that it is an incentive to firms to invest in research and development, fueling technological innovation and providing new pharmaceuticals. Arguably, without a substantial incentive to invest in research and development, fewer new pharmaceuticals would be available to treat disease and improve health.

A second barrier to market entry is the first mover advantage. Specifically, once a buyer has ''experienced'' or used a particular brand name pharmaceutical, there can be resistance to switching from the first-branded product to a branded therapeutic substitute or a generic version of the original product. One could also argue that the patient's prescriber is influenced by the first mover advantage since the prescriber may prescribe the same first-mover drug for a new patient if prior patients have had favorable experiences.

A third barrier to entry into pharmaceutical manufacturing is the required high initial investment in clinical and process manufacturing research and development, and the large capital investment in fixed assets.[6] Few firms are able to afford these large start-up fixed investment costs. Even in the generic pharmaceuticals marketplace, larger firms may be able to achieve manufacturing economies of scale, allowing them to produce a given pharmaceutical much more economically than a smaller competitor.

Regulatory Environment and the Impact on Supply and Demand. Federal and state governments influence the selling and buying of pharmaceuticals through supply-side and demand-side economics, respectively. Examples of supply-side economic impacts include the patent protection of branded pharmaceuticals described above, but also include the FDA review process, which serves as another barrier to entry (although arguably an intentional barrier to assure that only safe and effective medicines are sold). Other supply side regulations include an overall research and experimentation tax credit as well as an additional tax credit for orphan drug development. Perhaps the most significant demand-side regulation results from the 1960s when the Medicare and Medicaid programs were enacted. These programs increase the demand for pharmaceuticals, both directly and indirectly. While the Medicare program only began coverage for drugs under Part D in 2006, the program did provide limited drug coverage through some Medicare managed care plans prior to 2006.[7,8] Furthermore, the Medicare program indirectly impacted the demand for drugs since its inception because coverage of physician services led to additional prescriptions being written, which increased drug utilization even in the absence of drug coverage via out-of-pocket expenditures.[7]

Regulation can either move the equilibrium price closer to or further away from the perfectly competitive price. Clearly, patent regulations provide monopoly power to branded drug manufacturers in the short term and, therefore, raise prices in the short term.[4] One could argue that the average price over the long term is much lower because the generic prices that emerge after patent expiration are an indirect result of the initial branded product.

Third Party Insurance. Any discussion of health care markets in the United States needs to address the complex insurance market by analyzing how the insurance market affects the supply and demand of health care goods and services. Insurance provides cost sharing and thereby reduces the price that the patient perceives when purchasing prescription drugs. The out-of-pocket cost to the patient depends on the level of *coinsurance* and *deductible*. *Coinsurance* is the percentage of the total cost paid by the insured patient. The remainder is paid by the insurance company. A *deductible* is a fixed dollar amount that the patient must pay each year before the insurance company starts paying for any of the cost. Once the deductible amount is reached, coinsurance may apply.

When patient demand for medical care and/or prescriptions is relatively unresponsive to changes in price (ie, inelastic demand), there is little effect of insurance coverage on the market quantity consumed. If on the other hand, patient demand is responsive to the price of a particular good or service (ie, elastic demand) then insurance coverage would induce the patient to purchase and utilize health care goods and services more frequently. While this economic response to insurance coverage is beneficial when patients would otherwise underutilize drugs, there is a downside effect known as *moral hazard*.[9] Moral

hazard refers to the undesirable increased utilization of services due to the reduced (marginal) cost of the service to the consumer or user of the good. To reduce the negative effects of moral hazard due to insurance, insurance companies incorporate coinsurance, deductibles, and tiered formularies. These strategies are aimed at getting the patient to use those drugs that are deemed necessary and cost effective to a greater extent than those drugs that are less efficacious or less cost effective. Insurance companies also can influence the use of pharmaceuticals through prior authorization and step edits.

The insurance industry is heterogeneous both in terms of the types of beneficiaries covered as well as its approach to pharmacy management. As a result, the same patient may have to pay the entire cost of a specific drug ''out of pocket'' under one insurance plan, while the same drug may be covered on the formulary of another insurance company. Although pharmaceutical companies have limited monopolistic market power, they may be forced to bargain with large purchasers such as pharmacy benefit managers (PBMs) or insurers who also have some purchasing power to influence price, especially when therapeutically similar substitutes are available. Moreover, a pharmaceutical company may offer lower prices to negotiate favorable formulary positions.[10]

Asymmetric Information. The market for goods works under the assumption that all buyers and sellers have complete and accurate information about the price, quantity, and quality of the good being sold and no barriers to obtaining this information. In the pharmaceutical market, there is both incomplete and inaccurate information, as well as an imbalance in the amount of information about a drug possessed by the manufacturer, clinicians, and patients. Asymmetries in information may lead to suboptimal outcomes in the market. For example, if a clinician knows more about the treatment options than the patient, she may encourage the patient to adopt treatments that the patient would not otherwise have used. In most cases, this may be a good outcome. However, if the clinician recommends an unnecessary treatment, it may not be beneficial to the patient, but may increase profits for the clinician (a practice/phenomenon referred to as *supplier-induced demand*). However, this informational symmetry can exist in the other direction. Even when clinicians and pharmacists communicate well with their patients, informational asymmetries still exist. For example, a patient knows whether he is compliant with a prescribed treatment, but his healthcare provider may not know, which may lead to inappropriate or inadequate subsequent treatment.

Information asymmetry may play an important role in the care of patients with prescription drug coverage. Insurers may promote a drug within a therapeutic class that provides the best rebate, by putting it on a lower formulary tier.[11] Since patients are less informed about the best treatment, they may not consider other more expensive and/or better options, which may create a situation where patients receive suboptimal care. However, the problem of asymmetric information may be mitigated if pharmacists provide medication therapy management.

Short-term Shocks to Supply and Demand of Pharmaceuticals. Unpredictable disease outbreaks or shortages associated with unanticipated inventory problems also impact supply and demand. When new pandemics, natural disasters, or wars occur, there is a sudden increase in the demand for certain pharmaceuticals, such as antibiotics, vaccines, or wound care products. In the short term, the supply of such pharmaceutical products is constrained. One example of such a shock was the shortage of ciprofloxacin (Cipro) after an airborne anthrax (*Bacillus anthracis*) attack via US mail in 2001. The outbreak of anthrax occurred just weeks after the September 11 terrorist attack had created a panic in the United States. Many raced into doctors' offices to get Cipro prescriptions, a treatment for anthrax, creating a shortage in many local pharmacies. An example of a shock to the supply side of pharmaceutical products was the 2004 influenza vaccine shortage created by the suspended operation of Chiron Corporation, a major supplier of influenza vaccine to the United States. This resulted in a sharp reduction in nearly half of the needed doses for the 2004-2005 influenza season.[12] The limited number of remaining suppliers could not fulfill the shortage.

SUMMARY

The requirement for economics has increased in the prepharmacy and pharmacy curriculums, yet many students still have trouble understanding and explaining what makes the market for drugs different. The disconnect between the perfectly competitive market and the pharmaceutical market is multifaceted. This article described 6 relevant economics topics to integrate into pharmacy curricula lectures in a manner that highlights the direct relevance of economics to the practice of pharmacy.

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