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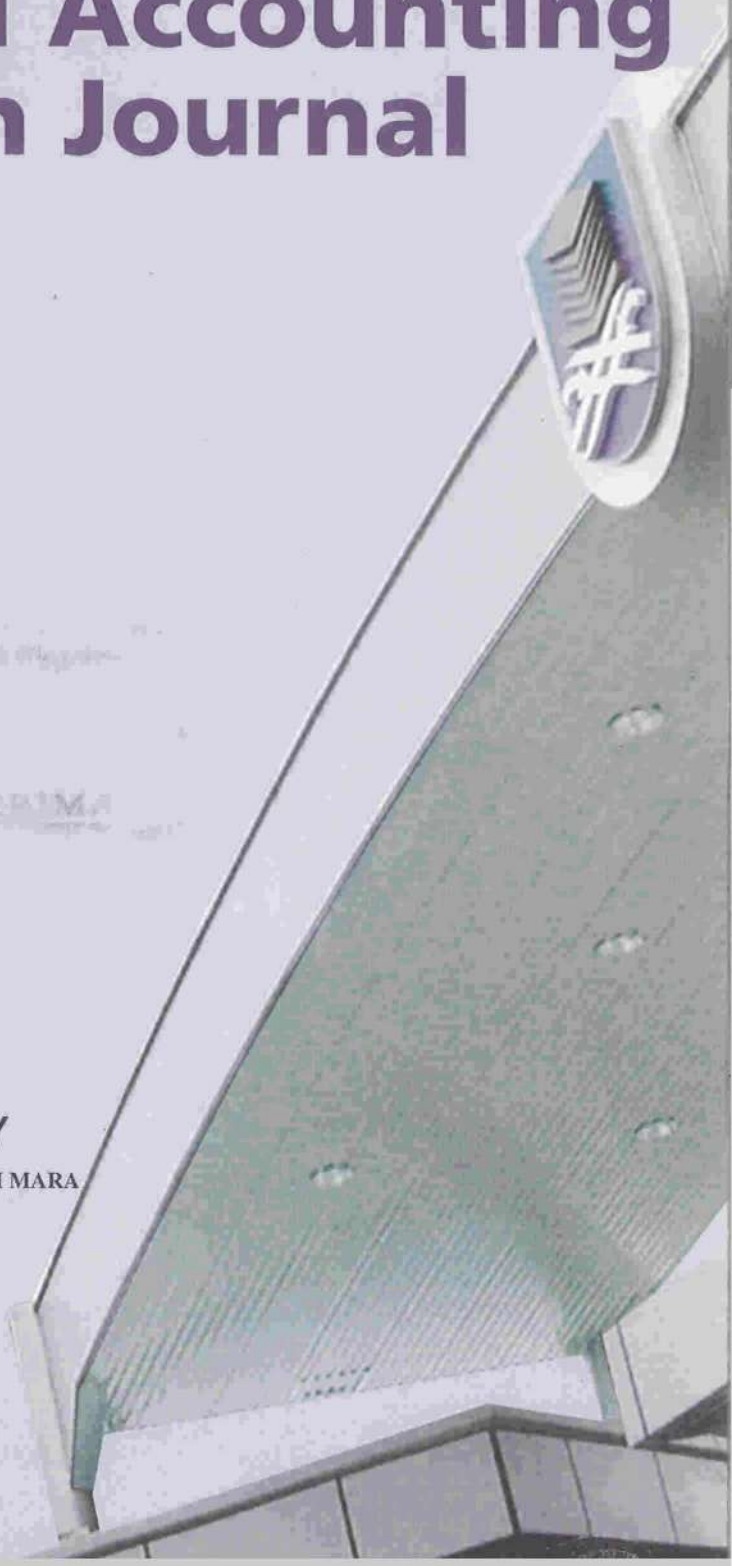

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Contents

Competition Policy Issue In Drug Companies: A Management Accountant's View

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Abstract

International Journal of the Economics of Business produced a special issue on 'Symposium on the US brand name prescription drug antitrust legislation' in 1997. This case involved fascinating scientific and policy issues including price discrimination. Economic scholars contributed to the debate. This paper gives a management accountant's view on the competition policy issue. It clarifies the competition policy issue using diagnostic tools (an analytical construct and concepts of cost). These diagnostic tools have been able to give insights into the issue.

1.0 Introduction

Competition in the supply of prescription drugs in the pharmaceuticals market has changed significantly, especially in the United States. The abolition of anti-substitution laws by individual states that had prohibited pharmacists from dispensing generic drugs in place of branded innovator drugs has contributed to a dramatic rise in the sales of generic prescription drugs.[1] In addition, changes in US federal law that speeded up the approval process for generic drugs, and health insurance companies contracting out the management of their prescription drug benefits to specialised pharmaceutical benefit management companies (PBMs), have also contributed to a dramatic rise in the sales of generic prescription drugs.

The *Drug Price Competition and Patent Term Restoration Act 1984* (commonly known as the Hatch-Waxman Act) has also encouraged growth in the supply of generic drugs by lowering the costs of obtaining United States Food and Drug Administration approval, and thereby lowering entry barriers. It eliminated the duplicative testing requirement for a generic copy of a previously approved innovator drug, and helped increase the availability of generic drugs following patent expiration. However, the Act also protects the potential loss of an innovator drug by extending the patent. The patent has been recently extended up to twenty years from the date of the filing.

A patent (in theory) confers perfect appropriability by granting legal monopoly for a discovery of a drug to a manufacturer for a limited period of time (Levin 1986). It is a very effective instrument for protecting the competitive advantage of new products and technologies in the industry. Drug manufacturers charge higher prices for innovator drugs as they try to recoup their sunk cost investments. In the case of drug companies, sunk costs consist of exogenous sunk cost, such as a plant of minimum efficient scale to produce drugs, and endogenous sunk cost including R&D and advertising, which are determined by business strategy rather than what is necessary to produce drugs. R&D, however, in this case could be considered as both an endogenous and an exogenous sunk cost, since a certain level of expenditure (the exogenous part) is such an essential aspect of operating in the drug industry. A manufacturer makes substantial investments in R&D, expecting financial returns from successful drugs high enough to warrant the effort and risk involved. If expected returns are too low, fewer projects will be pursued. If overall returns are more than required to justify the time, money and risk involved, then consumers are paying too much. Despite the protection conferred by a patent, the market power enjoyed by a manufacturer is only temporary. Aggressive entry by differentiated therapeutic substitutes competes away the advantages of the patent

[1] An innovator drug is one that obtains approval from the US Food and Drug Administration after extensive testing, receives a patent on its chemical formulation or manufacturing process, and is initially sold under a brand name. A generic drug contains the same active ingredients as the corresponding branded innovator drug, and enters the market after the patent on the brand-name drug has expired.

holder. The increase in the market share of generic drugs contributed to the decline in the financial returns on new drugs.

The structure of this article is as follows. The first section discusses an analytical construct that is relevant to the analysis of the case. The analytical construct can help establish which facts are relevant and which concepts of cost will shed light on particular issues in the case. The analytical construct discussed is price discrimination. The second section reviews concepts of costs which are used with the analytical construct to clarify issues in the case. It then proceeds with a discussion on a profit-maximising discriminatory pricing model. The fourth section analyses price discrimination in the drug industry by examining the cost structure of the industry and the implication for R&D of price discrimination and pricing decisions. Finally, a conclusion closes this section.

2.0 Price Discrimination

Price discrimination exists when a commodity is sold at a different location at a price that does not reflect different transportation or selling costs to different purchasers. Stigler (1966, p. 209) defined price discrimination as:

> *... the sale of two or more similar goods at prices that are in different ratios to marginal costs.*

There are, according to Pigou (1932), three forms of price discrimination. First, degree price discrimination involves a seller charging a different price for all different units of the commodity in such a way that the price charged is equal to the demand price for it, and it leaves no consumer surplus to the purchasers. Second-degree price discrimination exists when a seller is able to charge different prices that depend on the number of units of the commodity bought. Third-degree price discrimination occurs when a seller is able to segment his customers in such a way that each group of his customers pays a separate monopoly price. The third degree differs from the other two '... in that it may involve the refusal to satisfy, in one market, demands represented by demand prices in excess of some of those which, in another market, are satisfied' (Pigou 1932, p. 279).

For the monopolist, price discrimination is to maximise profit (Robinson 1946; Schmalensee 1981; and Katz 1983). In addition to maximising profit, a certain form of price discrimination can foreclose competition and acts as a barrier to entry to potential entrants. Wilson (1993) argued that price discrimination can have adverse distributional effects and it can promote inefficient uses of monopoly power. In a situation where a monopolist serves two distinct markets in which one market is stronger than the other, and when discrimination is allowed, it is possible to sell the commodity at two prices. This is done by fixing a simple monopoly price at a level at which the buyers of the weaker market can afford to buy. If at a simple

monopoly price the elasticities of demand are different in the two markets, it will pay to raise the price and cut down output in the less elastic market, and to reduce the price and to increase output in the more elastic market.

Price discrimination, on the other hand, can also have positive effects. Wilson considered efficient uses of non-linear pricing in the form of Ramsey pricing, particularly in cases in which the tariff offers the same terms to all consumers, product quality specifications are fixed and the firm is operating efficiently. Ramsey pricing is a pricing rule that deviates from marginal cost and its mark-ups are highest for those products that have the most inelastic demand.

Price discrimination has been treated differently by the various antitrust agencies in the three jurisdictions. In the United States, the intentions of various Acts are to protect 'small' businesses by controlling big corporations. In the United Kingdom, price discrimination has been condemned as a discriminatory behaviour that undermines or destroys competitors and discount structures which are not cost related. In contrast, the European Union considers third-degree price discrimination as an abuse that imposes restraints on intra-Community trade. The pervasiveness of price discrimination means that it is likely to be a prominent feature in antitrust cases in these three jurisdictions.

3.0 Concepts of Cost

A good understanding of concepts of cost is particularly useful when there are multiple ways in which the concepts are used in managerial decision processes. Costs are used for a variety of purposes, and the same cost data that serve very well for one purpose cannot be expected to serve equally well for other purposes. In the context of this article, these cost concepts which are discussed below help to cast light on particular issues in competition policy.

3.1 Variable Cost (VC)

According to Clark (1923), variable cost means a number of 'accounting items' that vary in proportion to variations in business. In more general terms, it is a cost that varies with the level of output. The variation of cost is made with reference to the fluctuation of production in a short period of time. In the long run, all costs are variable. There are various terms for variable cost. Marshall (1916, p. 359) called it 'special, direct or prime cost'. His 'special cost' included the cost of raw material used, the wages of the part of labour spent which is paid by the hour or by piece, and the wear and tear of the plant used in producing the commodity. This special cost is the lowest price that an entrepreneur can accept in time of excess capacity or when trade is slack. Marshall stated that, in normal circumstances, prices must be above prime cost.

3.2 Fixed Cost

Fixed cost is a cost that does not vary with the level of output. It is also known as fixed overhead. There are other terms for fixed cost. Clark (1923) used constant cost to describe fixed cost which means a number of accounting items that remain largely independent of business. Marshall (1916) called it supplementary cost which was taken to include standing charges for durable plant and the salaries of top management (his examples). Fixed cost in the short run is unchanged. In the long run, however, fixed cost is variable because all factors of production can be varied by management. For example, the size of a firm can be reduced or increased depending on the state of the economy and the performance of the firm. The decision to decrease or increase the size of the firm has an effect on those costs that in the short run are fixed. An example of fixed cost is investment in a plant which has a larger capacity than the existing one.

3.3 Sunk Cost

Baumol et al. (1982) defined sunk costs as costs that in some short or medium run cannot be eliminated, even by total cessation of production. As such, once they have been committed, they are no longer a portion of the opportunity cost of production. However, in the long run, all sunk costs are zero.

Sunk cost may further be divided into two: exogenous sunk cost, and endogenous sunk cost. Within exogenous sunk costs, Sutton (1991) differentiated two cases. The first case is when firms incur sunk costs, associated with acquiring a single plant of minimum efficient scale, to produce a homogeneous product. The second case is when firms incur sunk costs associated with acquiring a single plant of minimum efficient scale, to produce a differentiated product. The irrecoverable fixed outlays incurred in acquiring a single plant of minimum efficient scale on entering an industry constitute a sunk cost which plays no role in day-to-day pricing policy; prices set depend on the set-up cost (the cost of acquiring the plant) only indirectly.

In the first (homogeneous product) case, as the size of the market as measured by the population of consumers increases, the equilibrium number of firms entering the market increases. As a result, concentration generally declines. For any given level of concentration, any increase in the size of the market will tend to raise profits and encourage further entry.

In the two-stage game, firms decide whether to enter at the first stage. Those firms that have entered set their prices at the second stage. These two-stage game procedures serve to make a distinction between long-run and short-run decisions, in which the former are decided at the first stage and are treated as fixed parameters in the second stage of the game. If a mistake involving entry to

the industry has been made, revenues generated in the second stage may not be sufficient to cover the set-up costs incurred. The entry decision of the firm will depend on two variables: the level of set-up cost at stage 1; and the expected price competition at stage 2. The decision to enter will depend on whether the last entrant has covered the sunk cost incurred on entry at stage 1. If there is greater intensity of price competition at the second stage, the post-entry profits will be lower and fewer firms will choose to enter the industry.

In the second (differentiated product) case, firms offer products which are differentiated. Very few products are strictly homogeneous as transport costs are sufficient to introduce some degree of product differentiation among sellers situated in different locations. If transport costs are not important, small differences in the product can make a difference in the eyes of consumers. Even though the sunk costs incurred by all firms are equal and exogenously given, such differences may exist. When a number of distinct product varieties are produced, assuming that there are no economies or diseconomies of scope, separate set-up costs must be incurred to produce any one product. Therefore, firms will employ different strategies for different markets so that particular sunk costs can be recovered.

One of the implications of Sutton's theory is that, in the short run, attempts will be made by a firm to achieve normal returns on existing capacity by means of price co-ordination policy. But this attempt will fail because rivals will undercut its prices. In order to recover sunk costs, firms may either merge or not renew their plants when they become obsolete. This will lead to a rise in market concentration as exit occurs.

In the case of endogenous sunk costs, there are many components. Two examples of endogenous sunk costs are advertising and R&D expenditures. By incurring greater R&D expenditure or advertising expenditure at stage 1, a firm can enhance the demand for its product at stage 2. The increase in expenditure at stage 1 leads to higher sunk costs being incurred at equilibrium. In addition, a firm has to spend money on advertising to induce consumers to buy its product. The larger the size of the market, the larger are the profits achievable at stage 2, and therefore the greater might be sunk costs at equilibrium. There are two empirical features of advertising (Sutton 1991). First, a threshold effect may exist; a firm has to spend a certain sum of money in order to have an impact. Second, the effectiveness of advertising is subject to diminishing returns. Advertising also creates brand loyalty.

High endogenous sunk costs can contribute to barriers to entry into a particular market, particularly when new entrants have to sink liquid capital into frozen assets, whether tangible capital or intangible capital (Sutton 1991). The investments by new entrants may prove too risky as an incumbent, who have committed large amounts of funds to the business, may make retaliatory strategic responses to safeguard their investment. Certain investments by incumbent firms deter entry

and are profitable (though may suffer short-run losses) in the long run. Cave and Porter (1977) considered excess capacity, product differentiation, cost structure and vertical integration as barriers to entry.

The above argument explains why economists attach so much importance to sunk costs as barriers to entry. Fixed but not sunk costs, on the other hand, do not raise entry barriers. Both incumbents and entrants alike are affected by FCs; 'they offer an advantage to the incumbent only to the extent that his output is greater, and this permits him to spread his costs more thinly than the entrant can' (Baumol et al. 1982, p. 289).

3.4 Joint Cost

Hawkins (1969, p. 44) defined joint cost (in discussing jointly produced crude oil and associated natural gas) as:

> *... those costs incurred when the production of one product simultaneously and necessarily involves the production of one or more products.*

Kahn (1970) stated that the products are truly joint when they can only economically be produced in fixed proportions; they have no separate incremental cost function. Kahn returned to Pigou's (1913) example of the production of cotton fibre that would involve also the production of cotton seeds from which oil can be extracted. He maintained that there is no objective method for attributing '... causal responsibility for some part of the joint production costs to one of the products and the remainder to the other' (p. 79).

Joint cost poses analytical problems; it makes, for example, product costing and pricing difficult. The difficulty in product costing was illustrated by Walters (1960) in cargo freight services. According to Walters, these costing difficulties can be established by analysing the accounts of a particular firm or examining technological relationships to find which items of expenses would be increased if the output of one commodity was increased. The degree of cost jointness '... varies from the case in which there are rigidly fixed proportions (which more or less corresponds to the trucking case) to that in which the proportions of the product are highly variable (as in oil refining)' (Walters 1960, p. 420).

Jensen and Meckling (1976) illustrated the problem of joint cost in pricing joint products. According to Jensen and Meckling, any arbitrary allocation of joint cost without making any references to demand cannot be used in optimal pricing policy. This is because this arbitrary allocation lacks an economic explanation which reflects marginal revenues or marginal costs that are essential elements in any optimal pricing policy.

3.5 Incremental Cost (IC)

IC can be defined as the increase in cost as a result of producing a further output in addition to the existing output. Mathematically, the IC of product y_2 is defined as $C(y_1, y_2) - C(y_1, 0)$ where C(.) is the total cost function. The argument is that the price of product 1 which exceeds its IC is not 'unfair' to the buyers of product 2 since those buyers gain from the sale of product 1 at that price. Baumol (1986) considered that the consumers of product 1 are better off by the supply of that product. This is because consumers of the firm's other products must also gain as a group, and no consumers lose out in the process.

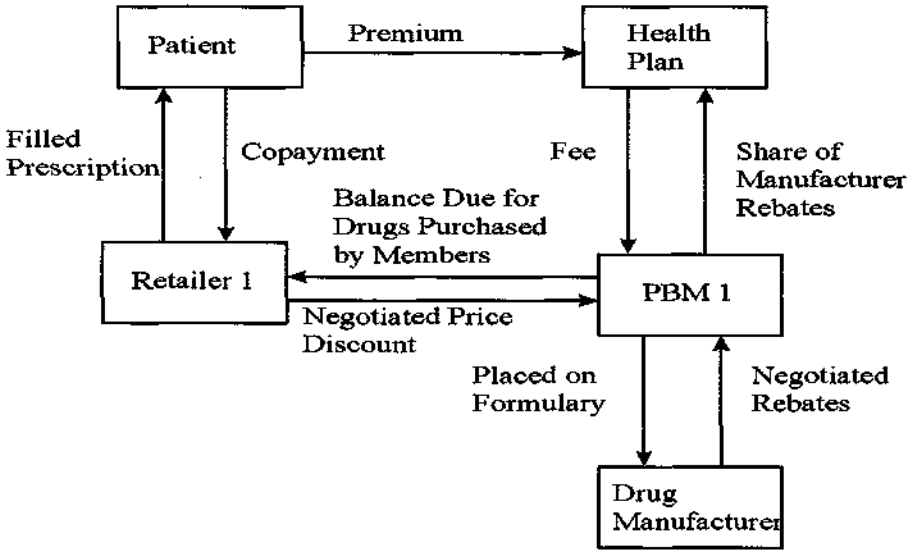
The definition of which output is the first one for a firm that produces two outputs may be of crucial significance because the first output bears all the common costs. There is no limit to the number of outputs which have to be considered, and this raises the issue of ordering (Heald 1996). For example, Aumann-Shapley prices are based on marginal costs averaged along a linear path from zero to current production, and Shapley prices are based on ICs averaged over all possible orderings of outputs (Curien 1991, p. 82).

4.0 Theoretical Issues

Managed-care X, retailers 1, 2 and 3 and hospital Y are hypothetical channels of distribution for drugs produced by a manufacturer. Since there are many manufacturers producing drugs for a similar group of ailments, a manufacturer has incentives to give discounts to those entities that can increase its market share of a particular drug. Figure 1 shows the role of pharmaceutical benefit management companies in the discrimination of drug prices. PBM 1, as a middleman in a variety of transactions with health plans, retailers and drug manufacturers, inserts itself into the payment system. A patient becomes a PBM 1 member by subscribing to a health plan in return for lower prescription drug prices. PBM 1 negotiates price discounts for its members in return for channelling them to retailer 1. PBM 1 also negotiates rebates from the drug manufacturer by steering its members toward a particular drug by using a formulary[2].

[2] *A formulary is a '... comprehensive list of drugs designed to direct physicians to prescribe the most cost-effective medications. The list is organized by therapeutic class; the selection criteria for the drugs on the formulary are primarily patient care and secondarily cost' [Blissenbach (1993, p. 152) quoted by Elzinga and Mills (1997, p.298)].*

Figure 1
The role of PBM 1 in exerting downward pressure on drug prices



Source: Adapted from US Congressional Budget Office (1998). How Increased Competition from Generic Drugs Has Affected Prices and Returns in the Pharmaceutical Industry, The Congress of the United States, July 1998, p. 8.

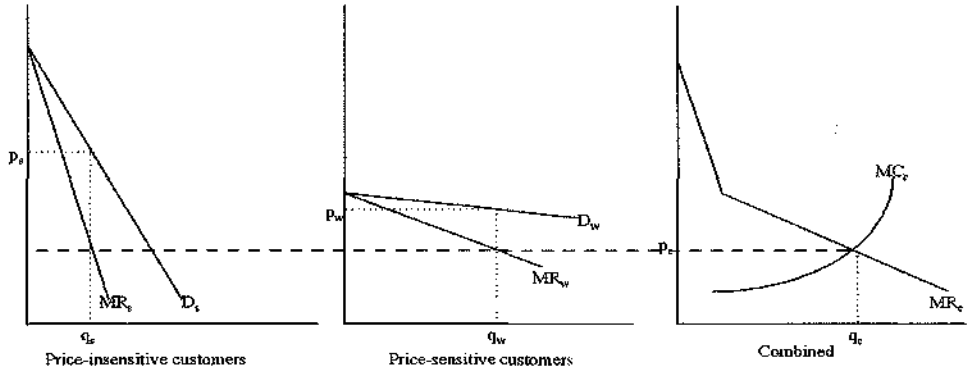
A drug manufacturer can increase its profits if it is able to segment 'customers into classes according to their demand elasticity' (Scherer 1997, p. 250). In the example above, the demand for a particular drug from managed-care X and hospital Y is elastic due to their ability to shift demand to cheaper drugs. On the other hand, the demand from retailers 1, 2 and 3 is inelastic. These retailers are unable to shift their demand to cheaper drugs because of the impracticality of getting consents from doctors who prescribe the drugs to their patients. By this segmentation, each group pays a separate monopoly price. Sales are made at higher prices to retailers 1, 2 and 3 with inelastic demand (in price-insensitive customer market) and at lower prices to managed-care X and hospital Y with elastic demand (in a price-sensitive customer market).

Figure 2 shows the manufacturer's profit-maximising discriminatory price structure.[3] For each of the markets, the relevant marginal revenue curves (MR_s and MR_w) are determined, and they are summed horizontally to give a combined marginal revenue (MR_c). The MR_c is then equated with combined marginal costs (MC_c) to determine the combined output; the combined output is at the intersection of MC_c and MR_c. The intersection point is then projected backward by a horizontal line, and is equated with each individual class's MR to give their respective outputs and prices.

[3]*The model is adapted from Scherer (1997).*

In the case of a price-insensitive customer market, q_s is the output produced at a higher price of p_s per unit, and in a price-sensitive customer market, q_w is produced at a lower price per unit (p_w).

Figure 2
Price discrimination by the drug manufacturer



Source: Adapted from Scherer, F. M. (1997). How US Antitrust Can Go Astray: The Brand Name Prescription Drug Litigation, International Journal of the Economics of Business, 4 (3), p. 251.

As the drug industry is characterised by high FCs and low VCs, the additional cost of producing an additional unit is small. However, the drug industry has to incur both R&D and marketing costs before the final products are manufactured. Greater expenditure in both exogenous and endogenous sunk costs may increase the demand for a firm's products through enhancement and development of products. These costs should be covered by the price of the final product in order to sustain incentives to develop innovative drugs (for a discussion on the cost structure of the drug industry see Schweitzer 1997).

5.0 The Case

The overall health-care system in the United States is exceedingly expensive. Rising medical care costs have encouraged more people to move into managed-care plans as they generally charge lower prices than conventional insurance plans. Managed-care plans are able to charge lower prices by negotiating better rates from doctors, hospitals and other health-care providers, and by reducing the use of high-cost services. In contrast, retail pharmacies do not have the ability to negotiate with drug manufacturers in order to extract discounts. However, most of the savings appear to be from pharmacies in the form of lower prices paid to them rather than from the rebates offered by drug manufacturers (see US General Accounting Office 1997).

Health-care organisations seek to control and minimise costs without sacrificing quality by influencing the prescribing decisions of physicians. Health Maintenance Organisations (HMOs) and PBMs influence prescribing decisions in several ways. HMOs provide health care primarily through employed physicians, and therefore they have a direct influence on prescribing decisions. PBMs, on the other hand, have only an indirect influence on physicians as the patients are their members. Elzinga and Mills (1997, p. 289) remarked that

> *The most effective forms of intervention by hospitals and managed care organizations influence prescriptions ex ante. These include (i) granting a manufacturer formulary access to consumers who are attached to managed care organizations or hospitals, and (ii) granting preferential (or even exclusive) status for a manufacturer's products with managed care organizations or hospitals.*

These organisations become powerful buyers which can influence the sales of drug manufacturers. They compile lists of suggested drugs (formularies) for their enrollees that encourage the use of generic drugs and cheaper brand-name ones. The use of formularies puts pressure on brand-name drug manufacturers to negotiate discounts as higher sales of generic drugs have led to lower average prices of prescriptions and a decline in the rate of return of brand-name drugs.

Table 1
Market share and average retail prescription price, by type of drug, 1994

	Market share		
	% of retail pharmacy sales	% of prescriptions dispensed	Average retail prescription price ($)
Innovator drugs			
Single source	55.5	37.5	53.80
Multiple source[4]	27.2	26.5	37.40
Generic drugs	17.3	36.0	17.40

Source: US Congressional Budget Office (1998). How Increased Competition from Generic Drugs Has Affected Prices and Returns in the Pharmaceutical Industry, The Congress of the United States, July 1998, p.15.

Two tables compiled by the US Congressional Budget Office (1998) assist in understanding the structure of the US prescription pharmaceuticals market. An innovator drug can either be single-source or multiple-source. Table 1 relates only to retail pharmacy sales which constituted 49 per cent of the US market in 1994. About 83 per cent of the total sales revenue was derived from innovator

[4] *If generic versions of an innovator drug were available in any dosage form, then all sales of all dosage forms of the innovator drug were classified as multiple source. Hence, an extended-release dosage form that had no generic versions was classified as a multiple-source drug if generic versions of the original formulation were available (US Congressional Budget Office 1998, p.15).*

drugs, and single-source drugs were the major contributors. By definition, single-source innovator drugs do not have generic rivals; their average retail price was the highest ($53.80) as manufacturers try to recoup their investments. The average retail price of innovator drugs with generic rivals ($37.40) was significantly lower than those without rivals, but higher than their generic rivals ($17.40). With the availability of generic drugs, PBMs, HMOs and other institutions preferred to use them as they tried to minimise their costs. As a result, generic drugs commanded a significant share of prescriptions dispensed at 36.0 per cent. Since innovator drugs formed a significant percentage of retail sales, competition among manufacturers on the basis of price has important implications for consumers (US Congressional Budget Office 1998).

Table 2
Average price differences to various purchasers in the pharmaceuticals market

Type of purchaser (A)	Average invoice price paid for 100 brand-name drugs (as a percentage of the average invoice price to pharmacies)		Market share by (A) in 1994 (%)
	1993 %	1994 %	
Retail pharmacies	100	100	85.6
Hospitals	91	91	4.2
Long term care facilities	96	95	3.4
HMO	80	82	2.7
Federal facilities	65	58	2.6
Clinics	95	91	1.6

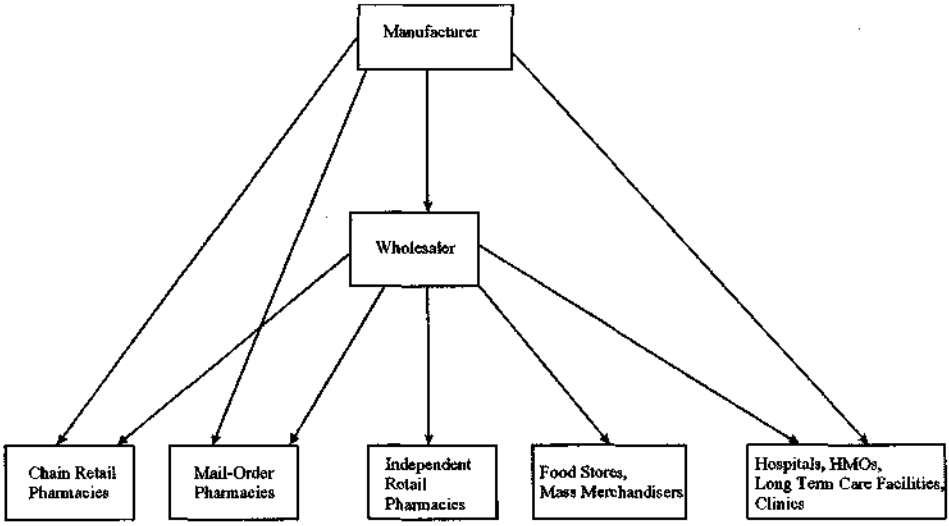
Source: US Congressional Budget Office (1998). How Increased Competition from Generic Drugs Has Affected Prices and Returns in the Pharmaceutical Industry, The Congress of the United States, July 1998, p. 25.

Table 2 shows the price comparison based on the average invoices paid by various purchasers for 100 brand-name drugs that were sold largely through retail pharmacies. This table shows only the comparison of invoice prices, excluding rebates and other types of discounts that do not appear on an invoice.[5] Rebates to PBMs are also excluded; these rebates are an important mechanism for lowering the average prices as manufacturers are paid for prescription drugs bought through retail pharmacies (US Congressional Budget Office 1998). Since invoice prices exclude rebates to PBMs, Table 2 may overstate the difference between the average prices that manufacturers earned from drugs distributed through retail pharmacies and the average prices they earned through other channels. Approximately 86 per cent of the revenues from those drug sales came from retail pharmacies.

[5]*Most discounts are negotiated 'in confidence' between drug manufacturers and purchasers and the information on these discounts does not become public (US Congressional Budget Office 1998).*

The other 14 per cent came from other purchasers. In 1993 and 1994, federal facilities obtained the best average prices for 100 brand-name drugs (65 per cent and 58 per cent).[6] HMOs, on the other hand, paid average prices of 80 per cent and 82 per cent in 1993 and 1994, respectively. Hospitals, long-term care facilities and clinics paid at least 9 per cent less, on average, than retail pharmacies for the same drugs.

Figure 3
Channels of distribution for prescription drugs



Source: Adapted from US Congressional Budget Office (1998). How Increased Competition from Generic Drugs Has Affected Prices and Returns in the Pharmaceutical Industry, The Congress of the United States, July 1998, p. 14.

Figure 3 portrays the transactions undertaken in this market. Most prescription drugs bought by various purchasers are from wholesalers. Some chain-store retail pharmacies, mail-order pharmacies, hospitals, HMOs, long-term care facilities and clinics also buy direct from manufacturers. In 1996, the majority share (75 per cent) of prescription drugs were distributed through pharmacies and other retail outlets (US Congressional Budget Office 1998). PBMs, HMOs and mail-order institutions found ways to reduce their mark-ups, and as a result, gained substantial sales volume (Scherer 1997). This has made them indispensable to drug manufacturers who seek to penetrate the market. Most HMOs have internal committees to list suitable drugs in a formulary for use in an illness. Listing in the formulary is critical to drug manufacturers' sales. Realising the importance of the formulary, HMOs began tough negotiations with manufacturers, eliciting discounts

[6] *The prices paid by federal agencies such as the Department of Veteran Affairs, the Indian Health Service and the Public Health Service as well as state pharmaceutical assistance programs are not affected by the best-price provision in the Medicaid rebate program which discourages discounting (US Congressional Budget Office 1998).*

from weak manufacturers, and then using these discounts to negotiate further discounts from other manufacturers.

PBMs use a similar strategy. When a physician regularly prescribes an expensive branded drug, a PBM representative will give a call advising the physician to use another equally effective and cheaper drug. If physicians refuse to accede, patients under their care will be assigned to other physicians. Drug manufacturers who refuse to give price reductions are dropped from the formulary. The threat of the loss of sales effectively enables PBMs to elicit rebates from manufacturers. Consumers who do not belong to any managed-care plans have to buy their prescription drugs from retail pharmacies, and therefore pay higher prices. Enrollees of managed-care plans pay much less than non-enrollees.

Prescription drugs are different from other consumer products in two respects. First, consumers buy only drugs that are prescribed by physicians. Second, in the United States, third-party payers increasingly pay for prescription drugs. Physicians and patients, however, are only interested in the therapeutic effects of prescription drugs. In contrast, third-party payers are more concerned with minimising costs. They normally contain costs by

> (i) controlling the pharmacy benefits of a closed group of patients, and (ii) stimulating price competition and discounting among the pharmaceutical manufacturers (and among retail drug stores) for access to these patients (Elzinga and Mills 1997, p. 289).

It was argued by drug manufacturers that revenues lost from discounts given were less than additional revenues gained from sales induced by price reductions (Weinstein and Culbertson 1997). Price discrimination increases drug manufacturers' profits. For their reported profitability, drug manufacturers have appeared numerous times near the top of published lists of, for example, *Fortune* magazine rankings (Scherer 1997).

In the long run, it is difficult for a large number of retail pharmacies to sustain such a competitive disadvantage, especially with small profit margins. The price paid by retail pharmacies can be viewed as the price paid by consumers who do not belong to any managed benefit plans, and are therefore paying the most for brand-name drugs. Between 1985 and 1997, 14,341 independent pharmacies were forced out of business; by 1996, they were only able to account for 21 per cent of dollar prescription sales (Reekie 1997).

6.0 Analysis of the Case

In the pharmaceutical industry, a manufacturer has to make high fixed and exogenous sunk cost investments in a plant to produce the drugs. In addition,

a manufacturer has to make substantial endogenous sunk cost investments which has contributed to rising costs in the industry. The increase in this endogenous sunk cost expenditure by one drug manufacturer leads other manufacturers to follow and thus results in higher sunk costs incurred (in equilibrium). The increase in the level of endogenous sunk costs incurred by a drug manufacturer is '... in step with increases in the size of the market' (Sutton 1991, p. 12). This explains the strategy of leading research-based firms that contributed 12 per cent of their revenue on these endogenous sunk costs in 1991, up from 10 per cent in 1965 and in 1992 the share rose to 16 per cent (the statistics were obtained from Schweitzer 1997). Only the computing, accounting machine and the office industry had a larger percentage of (endogenous) sunk cost investments than the drug industry (Schweitzer 1997). A drug manufacturing firm capitalises on successful new drugs by mass producing them.

Danzon (1997) has produced an estimate of the cost structure of the drug industry. Table 3 shows all costs of the drug industry measured as discounted present value at the time of the launch. According to Danzon (1997), the discounted present value of the costs provides a more accurate measure of the importance of R&D investments for the purpose of evaluating pricing adequacy. If these costs are not covered, drug manufacturers will lose the initiative to develop new drugs.

Table 3 shows that R&D costs account for about 30 per cent of total cost and manufacturing for only 28 per cent. Danzon (1997, p. 305) remarked that

> *The important characteristics of R&D for pricing purposes is that it is a global joint cost that is invariant regardless of the number of consumers or countries that use the drug.*

It is on this basis that R&D cannot be causally allocated to a particular patient group or country on a marginal cost approach (Danzon 1997). Other cost components are either joint cost across products within a country or across countries. Danzon remarked that drug development including clinical trials to prove safety and efficacy is conducted in many countries for regulatory submissions in those countries. The cost associated with drug development is thus increasingly a joint cost. For any compound, the primary production of the active ingredient is typically processed in one or two plants world-wide, and each primary production may produce several compounds. This implies that there is jointness in cost across products and countries. Costs that are ICs in a plant in one country are joint costs across products. Most of these joint costs are sunk by the time of product launch and price negotiation. By prohibiting competition from generic drugs, patent holders can recoup their investments in R&D by pricing above marginal cost.

Table 3
The cost structure of the drug industry: discounted present value at launch (percentage of total cost after tax)

Cost component	Tax assumptions	
	46% corporate tax	46% corporate tax, plus R&D and possessions tax credits
Total R&D cost	31.1	29.7
R&D	29.0	27.6
Ongoing R&D cost	2.1	2.1
Total manufacturing cost	28.2	28.7
Manufacturing and distribution	25.3	25.8
Capital expenditure (plant and equipment)	2.9	2.9
Other		
Marketing costs	23.4	23.9
General and administration costs	11.5	11.7
Working capital	3.3	3.4
Value of inventory	2.4	2.6
Total	100.0	100.0

Note: Assumes 10 per cent cost of capital

Source: Danzon, P. M. (1997). Price Discrimination for Pharmaceuticals: Welfare Effects in the US and the EU, International Journal of the Economics of Business, 4 (3), p. 305.

In this industry, pricing decisions are important. Although pricing drugs at short-run marginal cost is a first best option, '... the resulting deficits would require distortionary taxes in other markets to fund R&D' (Danzon 1997, p. 307). This is because short-run marginal cost accounts for only 30 per cent of total cost. If prices are uniform, there is a possibility that some products that can yield a positive net social benefit are not developed, and this is likely to reduce welfare (Danzon 1997). From an efficiency point of view, if a uniform price is charged to both groups, they are not charged according to their willingness to pay. Danzon (1997) suggested that Ramsey optimal pricing is used to set prices of drugs in the drug industry.

7.0 Conclusion

Price discrimination in the pharmaceutical industry is mainly due to the ability of the manufacturers to exploit the different elasticities of demand of various groups of consumers. This price discrimination eventually benefits and enhances the welfare of all consumers. Scherer and Ross (1990, p. 500) concluded that:

> *Another pro-competitive effect is the tendency of unsystematic price discrimination to undermine oligopoly discipline ... to utilise capacity more fully, producers grant secret, discriminatory price concessions to a few aggressive buyers. Sooner or later the word leaks out, often through the effort of buyers to extract similar concessions from additional suppliers, and others match or undercut the cuts. As the price concessions spread, list prices become increasingly unreliable, and eventually they are reduced formally, benefiting all buyers and not just the favoured few.*

As the industry has large fixed, exogenous and endogenous sunk costs, the manufacturers have an incentive to price their products to sufficiently cover their total costs. By setting higher prices in an inelastic market and lower prices in an elastic market that cover at least their VC, they can quickly recover their investment and invest surpluses in developing new drugs.

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