IMPACT OF PRESCRIPTION INSURANCE AND COMPETITION ON RETAIL PHARMACIES' PROFITS

by

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A dissertation submitted in partial fulfillment

of the requirements for the degree of

Doctor of Philosophy

(Pharmacy)

at the

UNIVERSITY OF WISCONSIN-MADISON

1996

ACKNOWLEDGMENT

This project was completed through the efforts and support of a number of people. First and foremost, I want to thank my major professor, Dr. David Kreling, for his hours of reviewing materials, assistance in soliciting cooperation from corporate pharmacies, and unlimited financial support. His belief in the project was fundamental to its success.

Likewise, I extend my appreciation to the other members of the dissertation committee. Drs. Wiederholt and Mount provided excellent insights relevant to the practice of pharmacy and understanding of the inherent difficulties in conducting this research. Their suggestions improved the quality of this product. The relationships Drs. Kreling, Wiederholt, and Mount maintain with pharmacists around the state were instrumental in achieving a higher than expected response rate. Dr. Hausch challenged me theoretically and consequently helped me create better arguments. His assistance also pointed me toward a career-long stream of research ideas. Dr. Rosenberg contributed to my understanding of the relationships between variables and generated new ideas for future work.

I want to thank Dr. Clayton Rowland for taking time to review the project and attend the defense. He was the original spark for pursuing this line of work. My thanks also go to my fellow graduate students at both the University of Wisconsin and the University of Iowa. The University of Wisconsin School of Pharmacy and the Sonderegger Research Center provided me with substantial support throughout my doctoral program.

This project would not have been possible without the participation of pharmacists around the state. I am eternally grateful to them.

My partner Jill was there for all the frustrations, breakthroughs, and final relief. Her understanding and guidance were invaluable. Although my family did not always understand what I was up to, they provided unending support and patience.

Last, but not nearly least, I must acknowledge my portable, lap-top miniature schnauzer Ryka. She reminded me of the necessity of taking time out for the simple pleasures of life.

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ABSTRACT

Health provider access is inextricably linked to reimbursement. As an increasing proportion of the local market is covered by prescription service benefits and competition for third-party contracts and remaining cash customers becomes more intense, pharmacies have fewer options for maintaining or increasing their returns. Since profit is the ultimate predictor of continued viability, it follows that to address the potential for access problems in pharmacy requires an evaluation of profit margins in the retail pharmacies. The purpose of this project was to consider simultaneously the impact of basic conditions in the market, market structure, and conduct on prescription department profits in the retail pharmacy industry.

The model and attending hypotheses were evaluated in a stratified, random sample of thirty-nine retail pharmacies located geographically in the lower two-thirds of Wisconsin. Data were collected through a combination of a questionnaire capturing owners'/managers' perceptions and a site visit during which financial data were taken directly from internal financial and operating documents.

Prescription department net profit was the overall performance measure of interest. Prescription volume, dispensing costs, and drug product acquistion costs were controlled in the regression analyses used to test six research hypotheses concerning the impact of third-party participation and competition on prescription department profits. Minimization of operating costs was a significant predictor of prescription department

profits in all models tested, consistent with economic theory. Participation in either private or public third-party programs was expected to have a negative effect on prescription profits, but neither hypothesis was supported statistically. The proportion of prescriptions covered by Medical Assistance had a positive effect on profit. Overall, though, adding the third-party variables did account for a significant proportion of variance. None of the three competition variables were significant nor did the model account for a significant proportion of variance.

While pharmacies have focused on cost-minimizing, this study suggests that other market place factors are also important. Going beyond the traditional study of economic efficiency, the model introduced in this study can be used to examine a broad range of issues. These can be issues of relevance to practitioners as well as academicians or policy makers.

CHAPTER I

INTRODUCTION

Health provider access is inextricably linked to reimbursement. Inadequate reimbursement for services is a significant contributor to lower physician participation in Medicaid and hospital closures (Mitchell, 1991; Hernandez and Kaluzny, 1983). As with physician and hospital services, restrictive reimbursement from third-party payers constrains the financial viability of pharmacies (Carroll, 1991b; McMillan, 1989; Stone, 1985). An additional constraint in the ambulatory prescription market is the extensive corporatization of community pharmacies. Large volume pharmacies can achieve economies of scale and scope that allow them to accept insurance contracts offering lower reimbursement for prescription medications. Reimbursement from such contracts is apt to be inadequate for rural pharmacies that cannot expand their volume due to limited population size and morbidity and thereby cannot accrue economies of scale.

As an increasing proportion of the local market is covered by prescription service benefits and competition for third-party contracts and remaining cash customers becomes more intense, pharmacies have fewer options for maintaining or increasing their returns. Potential losers as the market transforms include cash paying customers (the part of the market from whom pharmacies attempt to recoup their lost revenues from third-party participation), beneficiaries of prescription insurance coverage that

reimburses so poorly pharmacies refuse to participate, local communities whose pharmacies close due to their inability to compete, and the individual pharmacies who lose profits. Long run implications for the market include a potential for higher concentration and greater profits for the remaining firms.

Retail pharmacies unable to generate sufficient profit are the most likely to close. Closure of pharmacies may reduce access to prescription medications and pharmacy services and, consequently, lead to adverse health consequences for the community. Profit is the ultimate predictor of continued viability. It follows, then, that to address the potential for access problems in pharmacy requires an evaluation of profit margins in the retail pharmacies. An assessment of pharmacies' profits should predict their ability to survive in the face of future policy recommendations.

Previous research in the retail pharmacy industry has studied only isolated elements of the market such as costs of dispensing, administrative costs associated with third party participation, adequacy of third party reimbursement, variations in acquisition costs, cost-shifting between payers, and concentration defined as the number of pharmacies per population. Although these studies contributed important information, they failed to account for the relationships between those variables as they occur in a dynamic market. In some cases, the measurements were inadequate. The purpose of this project is to use a more global approach that includes in one model several factors important to understanding how the retail pharmacy industry performs. The model gives a framework for understanding how these variables are related. By simultaneously

considering basic conditions of the market as well as its structure and conduct, the model also provides a point of reference for predicting future profits in the retail pharmacy industry.

Two of the major factors currently shaping the retail pharmacy industry are third party participation and competition. The emergence of prescription insurance service benefits created two market segments: the insured market and the cash market including cash customers and clients with indemnity type insurance benefits. In the insured market, the third party payer stipulates the prescription prices in the contract with the pharmacies. Pharmacies must either accept the terms of the contract or lose the relevant client base. There are very few cases where the pharmacy can negotiate higher reimbursement levels. Pharmacies remain price setters in the cash market, but growing price competition may be limiting their pricing flexibility.

The growth in third party coverage has increased community pharmacies' reliance on these prescriptions as a source of revenue. On an aggregate level, it is estimated that the average pharmacy attains 50-60% of its prescription volume from third party service benefit programs (Schondelmeyer and Johnson, 1994; Schondelmeyer and Seoane-Vazquez, 1996). As a proportion of sales dollar volume, some pharmacies face over 70% of their business from third party prescriptions (Stone, 1985; Schondelmeyer and Seoane-Vazquez, 1996). While participation in third party programs is voluntary, most pharmacies feel compelled to accept prescription insurance programs to provide a service to patrons from their community and to retain market share (Stone, 1985). Acceptance

of third party contracts constrains pharmacies' conduct. If reimbursement in the insured market is insufficient, cost-shifting and ultimately access problems may develop as a result of such constraints.

The success of the pharmacy's conduct in response to the loss in price flexibility is limited by the elasticity of demand. If the cash market is less price elastic than the third party market, pharmacies should be able to charge higher prices and increase margins on private pay prescriptions to recover from the loss in price control imposed by the insured market (McMillan, 1989). However, competition will hold these margins down.

Despite an expanding market evidenced by the growing demand for prescription drugs, the total number of retail pharmacies has been relatively stable and is actually beginning to decline (Wiederholt, 1996). A transition from independent proprietorships to chain management has altered the composition of ownership. Chains accounted for 53% of the retail pharmacy outlets in 1995 compared to 25% in 1983 and 4.1% in 1967 (Wiederholt, 1996; Cady, 1975). The transformation often occurs through mergers and acquisitions though new construction does contribute to the growing chain ownership (Troy, 1995).

Competition in retail pharmacy has been intensified by this consolidation which occurs for several reasons (Troy, 1995). First, larger pharmacies can use increased volume to offset falling prescription department margins and maintain revenues. Second, suppliers have adapted to better serve large chains. Third, managed care contracts target large retailers for broad access at low cost. Finally, cost efficiencies accrue to pharmacies

with dominant market share. Constant or increasing returns to scale in retail pharmacy are associated with purchasing advantages based on volume discounts and fixed costs that account for a high proportion of operating expenses (Lohrisch, 1974; Reeder, 1987; Cady, 1975). Overall, pharmacies incur lower unit costs at higher outputs. As their costs decline, these pharmacies can offer lower prescription prices and accept lower third-party reimbursement.

Historically, the Federal Trade Commission (FTC) has viewed consolidation as pro-competitive (Troy, 1995). Lowering market prices is a goal of increased competition, so consolidation itself is not reason for concern. The FTC stance has changed more recently, though, as mergers are proposed between large chain operations. Market share information is increasingly important to monitor potential anti-competitive behavior. Concentration may increase in the long-run as inefficient firms exit the market.

For community pharmacies, inefficiency may result in acquisitions, mergers or closures. In communities where pharmacies close without a replacement outlet, patrons will be left with reduced access or may be left without access to prescription medications and pharmacy services. With independent pharmacies disproportionately located in rural areas, their ability to compete with large chains for third party contracts as well as private pay prices is clearly limited. Patient populations such as Medicaid enrollees may be differentially impacted by the loss of independent pharmacies since they maintain a higher Medicaid participation rate then chain-operated pharmacies (Adams, Kreling, and Gondek, 1994; Wiederholt, 1994; Schondelmeyer and Johnson, 1994; Schondelmeyer and

Seoane-Vazquez, 1996).

Assessing the Impact of Third Party Programs and Competitive Forces

Given these major changes in the environment, a study of retail pharmacy performance is warranted. Historically, retail pharmacies relied upon the prescription department as a source of income for the entire outlet (Berger and Pearson, 1986). The increase in third party participation and competition in the industry since the time of that study may be eroding the economic well-being of retail pharmacies. The goal of the following model is to quantify the relationships between third party participation and competition and profits in the current market.

The model of the market for retail prescription services is based upon similar models developed for the physician services and nursing home markets (Scanlon, 1980; Feldstein, 1988). One advantage of the nursing home model is that a goal other than profit maximization can be assumed (Scanlon, 1980). There is evidence that retail pharmacies may not be profit-maximizing (Rossiter, 1977; Adams, Kreling, and Gondek, 1994). An alternative to profit maximization is sales or output maximization (Scanlon, 1980; Rossiter, 1977). Optimization in this model demonstrates that firms will produce up to the output level where average costs equal average revenues (Scanlon, 1980). Output maximization is based upon intuitive observations of owners and managers (Baumol, 1958). This intuition is especially appealing in the retail pharmacy industry since two of the primary decision tools pharmacy managers rely on are cost-of-dispensing

which is a component of average cost and average prescription charge which is equivalent to average revenue. Use of these tools implies that pharmacists' behavior may be more consistent with output maximization. Pharmacy managers also consider prescription volume rather than profit as an outcome measure.

Output maximization leads to a higher output at a lower price than profit maximization (Baumol, 1958). The slope of the average revenue curve will reflect the relative reimbursement level of each payer in the market, the output for each level, and the product mix within each market (Carroll, 1991b; Raisch, Larson, and Bootman, 1989; Kotzan and Carroll, 1991). Average revenue from the private pay market depends upon the level of output and reimbursement. Reimbursement, though, is hypothesized to be increasingly affected by competition within the local pharmacy market. Thus, the degree of price discrimination pharmacies can exercise will be limited. Any payer reimbursing at levels below the intersection of average cost and average revenue should be denied.

In essence, this model suggests the following outcomes. If a pharmacy signs a third party contract that merely converts part of their existing cash market into insured clients, the pharmacy will lose revenue. There are two mechanisms to increase revenue, though. The first is to increase prices to the remaining cash customers. The other is to increase their client base, either with cash or third party customers. Increasing prices to cash customers will reach a limit based upon the price sensitivity of the market and rival firms' reactions. As an increasing proportion of the local market is covered by prescription service benefits, pharmacies have fewer options for maintaining or increasing

their returns. Signing a third party contract may expand a pharmacy's market helping it to achieve increasing returns to scale, but reimbursement may be suboptimal. Pharmacies can participate in third party plans that offer inadequate reimbursement and run the risk of financial losses, or they may refuse such contracts. Either way, significant access problems can arise for the local market.

From the foregoing discussion, the output maximization assumption offers a reasonable alternative to profit-maximization in retail pharmacy. Pharmacies are more apt to use averages when considering third party programs, e.g average cost-of-dispensing and average prescription price. Profits will not necessarily be maximized, but they reflect pharmacies' abilities to survive given the market's basic conditions, structure, and conduct.

CHAPTER II

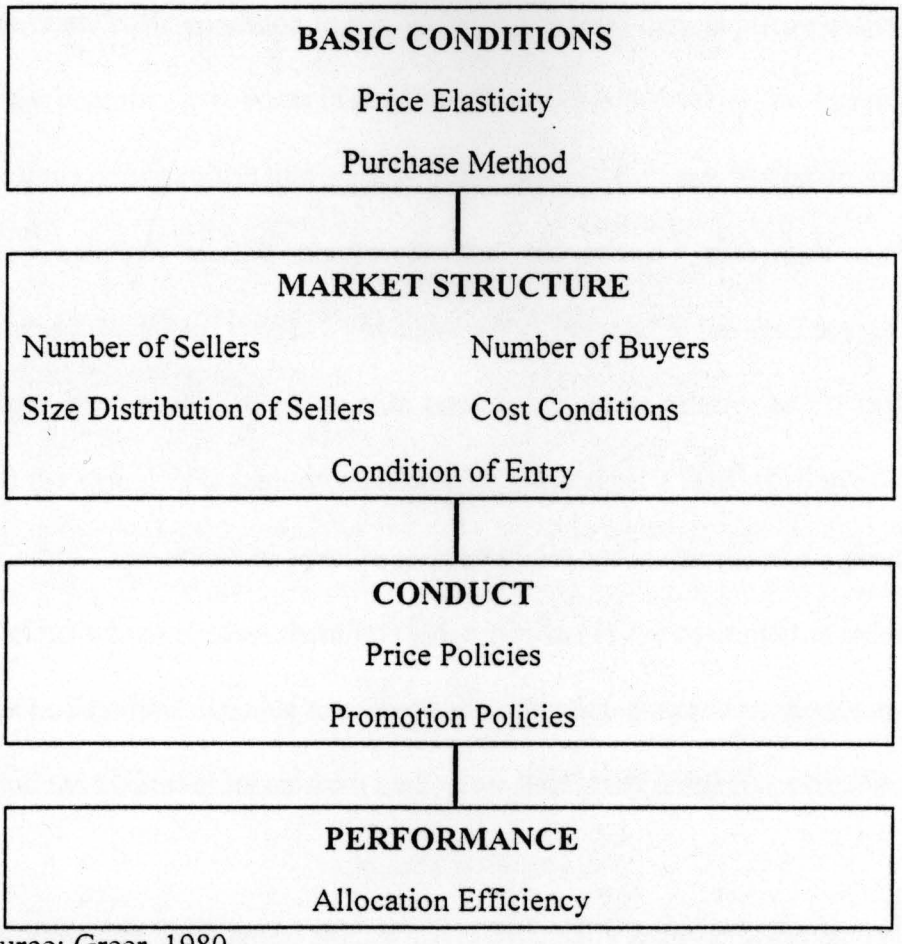
REVIEW OF THE LITERATURE

The guiding framework for this discussion of the market for retail pharmacy services is the structure, conduct, and performance model of industrial organizations shown in Figure 1 (Greer, 1980). This review is limited to circumstantial and empirical evidence of elements in the model, included in the figure, that add to the theory on the retail prescription market presented in the closing section. This does not imply that the other elements are unimportant, but rather that evidence about those other elements either is lacking or not applicable to the present study. The primary focus of this discourse is the impact of an increasing buyer and seller power on the profitability of retail pharmacies. To that end, the literature review proceeds from basic conditions in the market to the market's structure and conduct, and finally to its performance. The final section presents the model and hypotheses submitted for investigation.

Basic Conditions

The basic conditions supporting the existence of a market constitute its environment (Greer, 1980). These conditions are exogenous factors that firms within the industry cannot manipulate. Two related demand-side characteristics are considered in this section: customer purchase method and price elasticity.

Figure 1. A Model of Industrial Organization Analysis



Source: Greer, 1980

Purchase method refers to how consumers pay for the goods they will consume. The emergence of prescription insurance service benefits created two types of prescription consumers: the insured market including publicly funded and private service benefit coverage and the cash market including cash customers and clients with indemnity type insurance benefits. Pharmacies are price takers in the insured market with prices stipulated in the contract between the pharmacy and the third party administrator. In the

cash market, pharmacies are able to set prices given constraints imposed by competition.

The other basic condition in the market considered here is price elasticity. The success of the pharmacy's conduct in any type of market is limited by the degree of price sensitivity of the consumers in that market. If the demand for prescription drugs is more inelastic in the cash market, pharmacies can set prices higher than third party reimbursement (McMillan, 1989). The elasticity of demand in the cash paying market depends upon the morbidity of the cash paying customers relative to the third party market and the extent of indemnity coverage. For instance, a large portion of the cash market is elderly. The elderly have more co-morbidities and, subsequently, a greater need for medications which renders them less price elastic. If the cash market is less price elastic, pharmacies should be able to charge higher prices and increase margins on private pay prescriptions to recover losses from inadequate third party reimbursement (McMillan, 1989).

Unfortunately, there are no studies that differentially analyze the demand elasticity of the cash and insured markets, though the elasticity of demand in the insured market has been more extensively quantified (for reviews, see Levy, 1992 and Reeder, et al., 1993). Most demand elasticity data have been collected in studies of the effects of introducing insurance coverage and varying cost containment measures by insurers on utilization (Smith and Garner, 1974; Phelps and Newhouse, 1974; Weeks, 1973; Greenlick and Darsky, 1968; Nelson, Reeder, and Dickson, 1984). The evidence to argue that demand elasticity varies between the cash and insured markets is not conclusive. The insured

market is more price insensitive when nominal copayments are used, but for higher rates of coinsurance, the demand elasticity may not be all that different from the cash market (Smith and Garner, 1974; Phelps and Newhouse, 1974; Weeks, 1973; Greenlick and Darsky, 1968; Nelson, Reeder, and Dickson, 1984). This combination of purchase method and demand elasticity between types of purchasers sets the basic conditions under which a pharmacy operates.

Market Structure

Basic environmental demand and supply conditions generate the need for a market (Greer, 1980). The buyers and sellers who exchange goods and services in the market have characteristics that suggest how they will interact. The insured market is gaining prominence and power as a buyer in the retail prescription market, and market power on the seller side also is changing as the industry consolidates. Trends depicting these changes for each side of the market are reviewed in this section, including empirical evidence on factors contributing to the changes. These factors have been described in studies of the cost structure of and conditions of entry into the retail pharmacy industry.

Buying Power in the Retail Pharmacy Market

Pharmacies operate in markets consisting of varying proportions of insured customers. As the market moves from individual consumers to larger groups of consumers, market power shifts to these groups and their benefits' managers. Insured

groups primarily spring from two sources, private employment based plans (e.g. PCS or PAID prescription card plans) and public indigent/need based plans (e.g. Medicaid). For companies with more than 100 employees, prescription insurance coverage is included in approximately 95% of employee benefits packages in the United States (Levy, 1992). The majority of benefits packages (70%) are indemnity plans based upon coinsurance or deductibles. The remaining 30% are services benefits using managed care or card plans.

Trends in the growth of the insured market are presented in Table 1. In 1969, only 11.9% of retail pharmacy prescriptions were covered by service benefit programs (Campbell and Hammel, 1973). Since then, there has been substantial growth in the private prescription insurance coverage while the Medicaid program has consistently accounted for approximately 15% to 20% of all dispensed prescriptions. Combining private prescription insurance with public assistance in 1995, approximately 64% of all prescriptions were covered by a service benefit insurance program (Schondelmeyer and Seoane-Vazquez, 1996).

The growth in third party coverage has increased community pharmacies' reliance on these prescriptions as a source of revenue. On an aggregate level, it is estimated that the average pharmacy attains over 50-60% of its prescription volume from third party service benefits (Schondelmeyer and Johnson, 1994; Schondelmeyer and Seoane-Vazquez, 1996). As a proportion of sales dollar volume, some pharmacies face over 70% of their business from third party prescriptions (Stone, 1985; Schondelmeyer and Seoane-Vazquez, 1996). While participation in third party programs is voluntary, most

pharmacies feel compelled to accept prescription insurance programs to provide a service to patrons from their community and to retain market share (Stone, 1985). The growing number of enrollees in service benefit programs guarantees an even greater reliance upon third party payments in the future.

Table 1. Proportion of Prescription Volume Covered by Third Party Service Benefits

	Annual RX Survey			Lilly Digest		
Year	**All**	**Medicaid**	**Other Third Party**	**All**	**Medicaid**	**Other Third Party**
1980	25.4	13.4	12.0			
1985	28.4	15.0	13.4			
1986	30.5	15.3	15.2			
1987	35.1	17.8	17.3	30.0	18.0	12.0
1988	38.8	17.9	20.9	40.0	17.0	23.0
1989	41.5	18.9	22.6	39.1	16.8	22.3
1990	40.0	14.4	25.6	40.4	18.1	22.3
1991	44.8	15.2	29.6	42.6	18.9	23.7
1992	48.5	22.7	25.8	46.0	20.0	26.0
1993	54.8	24.3	30.5	52.0	20.0	32.0
1994	58.7	17.7	41.0	N/A	N/A	N/A
1995	64.1	16.3	47.8	56.0	21.0	35.0

Lilly Digest data reflects independent pharmacy operations only.
Sources: American Druggists' Annual Prescription Survey, 1982-1996; Lilly Digest, 1988-1992; NARD-Lilly Digest, 1994-1995.

Service benefit contracts involve payment from the insurance payor rather than

from the client. Reimbursement is usually fixed at some estimate of acquisition cost plus a dispensing fee. Under indemnity coverage, clients pay for the prescription out-of-pocket and submit a claim to their insurer. Pharmacists may charge their usual and customary price for these prescriptions. Even indemnity plans, however, face the potential for fixed reimbursement schedules as an attempt to exert oligopsonistic power upon manufacturers (Levy, 1992). If usual and customary prices exceed the fixed reimbursement, beneficiaries may be forced to incur any excess unless benefit managers can devise programs where the pharmacies absorb the loss.

Sellers' Power in the Retail Pharmacy Market

Along with the growing oligopsonistic power, and partially in response to it, the supply side of the retail pharmacy market is transforming into larger volume sellers with greater market concentration. Despite the growing demand for prescription drugs, the total number of retail pharmacies has been relatively stable at approximately 60,000 over the ten year period 1983 through 1993 and appears to be switching to a decline in absolute numbers (Table 2) (Wiederholt, 1996). A transition from independent proprietorships to chain management has altered the composition of ownership. Mergers and acquisitions help explain the relative stability in the number of pharmacies in the U.S., but ownership patterns have clearly changed. Historically, independent entrepreneurs dominated the market. Almost 96% of retail pharmacies were independently owned in 1967 (Table 2). Restrictions upon ownership in States' regulations often precluded chains from

developing (Fletcher, 1967; Cady, 1975). As those regulatory restrictions were removed, the number of chain owned pharmacies grew. The quantity and proportion of pharmacies under independent ownership shows a persistent decline. Chains accounted for 53% of the outlets in 1995 compared to 25% in 1983 and 4.1% in 1967 (Wiederholt, 1996; Cady, 1975).

Table 2. Composition of Retail Pharmacy Ownership

Year	Independent	Chain	Clinic & Other	Total
1967	38,000 (95.9)	1,621 (4.1)	NA	39,621
1983	39,079 (68.4)	14,404 (25.2)	3,663 (6.5)	57,146
1984	39,377 (66.7)	15,723 (26.6)	3,924 (6.6)	59,024
1985	39,589 (65.4)	16,721 (27.6)	4,185 (6.9)	60,495
1986	39,549 (64.2)	17,655 (28.7)	4,373 (7.1)	61,577
1987	38,785 (62.7)	18,706 (30.2)	4,363 (7.0)	61,854
1988	36,877 (60.9)	19,443 (32.1)	4,223 (6.9)	60,543
1989	34,944 (58.9)	20,153 (34.0)	4,238 (7.2)	59,335
1990	34,428 (58.0)	20,711 (34.9)	4,251 (7.2)	59,390
1991	33,018 (54.7)	24,838 (41.2)	2,464 (4.1)	60,320
1992	31,502 (53.2)	26,138 (44.1)	1,587 (2.6)	59,227
1993	29,503 (49.6)	27,536 (46.3)	2,429 (4.0)	59,468
1994	26,585 (45.6)	29,011 (49.8)	2,667 (4.6)	58,263
1995	25,289 (42.0)	32,036 (53.2)	2,845 (4.7)	60,170

Numbers in parenthesis represent the proportion of total.
Sources: Wiederholt, 1996; Cady, 1975

The retail pharmacy industry, despite demand growth, has been consolidating

since 1987. The overall number of pharmacies has declined by approximately 1,680 units. Consolidation occurs for several reasons (Troy, 1995). First, larger pharmacies can use increased volume to offset falling prescription department margins and maintain revenues. Second, suppliers have adapted to better serve large chains. Third, managed care contracts target large retailers for broad access at low cost. Finally, cost efficiencies accrue to pharmacies with dominant market share.

Combined, these factors should generate a more efficient and competitive market. The level of competition, however, depends upon the definition of the market. If one views the total number of pharmacies operating as individual units, retail pharmacy seems competitive already. When the definition switches to ownership or the local trading area, mergers and acquisitions may be anticompetitive. Table 3 shows the number of units owned by the ten largest chains, their pharmacy sales volume, and their percentage of chain pharmacy sales based on the top 50 chains. Those top ten chains held about 75% of chain pharmacy sales. Using estimates from the Prescription Trends Survey 1994 and the Annual Report on chain drug store activity, the top four and eight chains in terms of prescription sales held 16% and 25% of the retail market for prescription drugs, respectively. The top ten chains operated 62.5% of the chain outlets and two-thirds of retail chain prescription sales (McCarthy, 1995).

Table 3. Leading Pharmacy Chains: Number of Pharmacies and Pharmacy Sales for 1993

Chain	Number of Pharmacies	Sales ($Millions)	Industry Sales (%)[a]
Walgreen Co.	1,803	3,150	15.9
Eckerd Drug	1,699	2,129	10.7
Rite Aid Corporation	2,607	2,125	10.7
CVS	1,081	1,580	8.0
American Drug Stores	796	1,431	7.2
Hook-SupeRx (HSI)	1,121	1,150	5.8
Revco D.S.	1,904	1,125	5.7
Thrift Drug	507	792	4.0
Longs Drug Stores	305	725	3.7
Medicine Shoppe	998	716	3.6

a. Percent chain pharmacy sales is based upon the total prescription sales of the top 50 chains.

Source: Drug Store News, 1994a

Despite the busy consolidation activity in the retail pharmacy market, researchers have seemingly been uninterested. There are no public reports of the impact of consolidation on the structure, conduct or performance of the industry, and the Federal Trade Commission (FTC) historically has viewed the activities as procompetitive (Troy, 1995). The trend of consolidation is expected to continue (McCarthy, 1995). Some chains expect to continue expansion by acquiring independent pharmacies and new construction (Troy, 1995). Walgreens forecasted acquiring 20 to 30 stores per year in 1987 (American Druggist, 1987). In some cases, mergers occur between two larger chains. For instance, the Revco and HSI merger involved the eighth and ninth largest

chains in the U.S. (Drug Store News, 1994b). Together these chains operated 2,371 drugs stores in 25 states. Rite Aid acquired Perry Drug Stores at the end of 1994, giving Rite Aid an additional 224 pharmacies (Drug Store News for the Pharmacist, 1995). Rite Aid now owns over 2,800 pharmacies. At about the same time, Thrift Drug purchased 97 Kerr Drug Stores. Market share information is increasingly important to monitor potential anticompetitive behavior.

For retail markets, the degree of competition any given pharmacy outlet faces depends upon the number of rival firms that exist in the same local market (Bain and Qualls, 1987). The limits of the area served by a community pharmacy are determined by access in terms of travel distance and the size of the population in the market. The most common criterion that patrons use to select pharmacies is location (Smith and Coons, 1992.). The availability of mail order pharmacies somewhat alters the options for prescription users, but the relevant local market still tends to be defined geographically. Neighborhood pharmacies or pharmacies close to the work site are most likely to be used. If only one pharmacy is available in a given geographic area, selection is obviously limited. The single pharmacy then theoretically operates as a monopolist by supplying all of the output of prescriptions in that market. In larger urban areas, on the other hand, a large number of pharmacies may exist in close proximity. Such cases are expected to illustrate a more competitive model.

Local competition in retail pharmacy has been defined as the number of pharmacies per thousand population within a particular market area, prescription volume,

type of pharmacy, and community size (Norwood and Gagnon, 1975; McMillan, 1989). Two studies of retail pharmacy have analyzed competition as a function of firm concentration by population. Norwood and Gagnon (1975) measured concentration as the number of pharmacies per thousand population for each city or town where participating pharmacies were located. Concentration was not a significant factor for gross margins when volume was included in the model. The generalizability of this model may be limited, however, since Iowa did not have any population centers larger than 200,000. One would expect greater levels of competition in the largest population areas, though community size was not a significant predictor of gross margins. McMillan (1989) also used a concentration predictor in his study of cost-shifting. The number of pharmacies within a zip code per population within that zip code did not contribute significantly to his model of gross margin differences between private pay and third party prescriptions. Comparing the number of pharmacies per population implies that all firms are of equal size. Volume, however, is a significant predictor of margins (Norwood and Gagnon, 1975). Volume, as divided into two or three categories, was significant in the analysis of variance models that included pharmacy concentration and ownership type.

Type of pharmacy has been inconsistent as a measure of competition. Norwood and Gagnon (1975) compared prescription gross margins among three types of pharmacies: professional, traditional community, and promotional discount. The type was significant even when volume was included as a factor. Professional pharmacies had the highest gross margins, and promotional-discount had the lowest. In McMillan's

(1989) cost-shifting study, chain and independent pharmacies in Georgia were differentially affected by payer programs. The cost-shift amount for chains came from private third party programs while independents incurred their cost-shifting as a result of Medicaid participation. Rossiter (1982) also tested the chain versus independent dichotomy in a duopoly model derived from reaction functions. Demand function estimates were consistent with rival interaction, but the distinction between chain and independent pharmacies, was not significant. His results supported the existence of oligopolistic behavior in retail pharmacy, but dividing firms by ownership type did not provide additional information.

A more adequate measure of competition may be the number of firms in the local trading area, such as has been used in studies of retail grocery stores and hospitals. In the case of grocery stores and hospitals, the local market is considered to be a 15-mile radius (Cotterill, 1986; Friedman and Shortell, 1988), and for grocery stores in urban areas, the distance may be reduced to three miles (Cotterill, 1986). In the case of retail pharmacies, volume and level of third party participation may be important covariates (Norwood and Gagnon, 1975; McMillan, 1989).

Conditions of Entry

Another important variable in the discussion of market structure is the ease of entry. A market that operates profitably will lure additional firms into the industry. The ability to enter the market depends on what barriers have been established by regulations,

cost conditions, and existing firms' conduct, e.g. advertising.

For some rural and small town locations, only one community pharmacy may be in operation. As the population increases, the number of pharmacies needed to meet demand increases. Since the demand for prescription drugs is a derived demand for health controlled by prescribers, each pharmacy must compete for a predetermined number of patrons. An estimated population size of 500 or more is necessary for a single pharmacy to enter the market (Bresnahan and Reiss, 1991). The entry of the second firm occurs when the population exceeds 2,000. Subsequent entry thresholds for the third, fourth, and fifth firms are approximately 5,000, 7,600, and 9,400. Entry into a mature industry such as retail pharmacy is not necessarily the best indicator of structure, however. Most pharmacies have existed for a significant period of time, and the number of mergers and acquisitions masks the difficulty of entry into or exit from this industry.

Cost Structure

The cost structure of the retail pharmacy industry is perhaps the most thoroughly investigated aspect of the market. In fact, the cost structure of the prescription market as a separable output within pharmacies has been examined widely. Analyses can be divided between operational costs and input costs associated with the drug product. Studies have also been performed to distinguish between the differential costs of private pay versus third party prescriptions and to investigate potential economies of scale. As such, they provide information necessary to evaluate the adequacy of third party

prescription dispensing fees (Knapp, 1971).

The results of several cost-of-dispensing studies are summarized in Table 4. Disparities in cost estimates may reflect geographic variations in wage rates or other input factor cost variation. Despite differences in methodologies between studies, some of the results are similar.

Studies comparing costs associated with dispensing third party prescriptions versus cash prescriptions show that third party prescriptions require additional processing which increases administrative costs. Third party costs include carrying cost (receivables), data processing, and miscellaneous third party department costs. Almost half of the time consumed in third party prescription functions is spent on completing claim forms.

Administrative costs per third party prescriptions averaged $0.67 in 1979 (Health Information Designs, 1979). A press release from a chain drugstore in 1988 reported it cost $0.97 less to dispense a cash prescription (Rite Aid Prescription Dispensing Costs, 1988). A detailed survey of a national sample of chain pharmacies found a difference of $1.25 between third party and private pay dispensing costs (Schafermeyer, Schondelmeyer, and Thomas, 1990). Expenses that were significantly greater for third party prescriptions included personnel expense, computer expense, third party receivable carrying cost, third party bad debt, and central administrative expense. Complementary data from a sample of independent pharmacies also indicated a $1.25 difference between private pay and third party prescription expenses, though Carroll did not impute any third

party carrying cost (Carroll, 1991a).

Table 4. Summary of Cost-of-Dispensing Studies

Source	Year	Location	Sample Size	Unit Cost ($)
Look, 1969	1969	Wisconsin	75	1.72
Holberg, 1975	1973	Wisconsin	112	2.10
Pathak, 1982	1979	Ohio	39	3.32
Hadsell & Oberstein, 1985	1984	Minnesota	205	4.27
Berger & Pearson, 1986	1984	Alabama	241	3.04
Roberts, et al., 1987	1986	Tennessee	204	3.79
Roberts, et al., 1988	1986	Tennessee	60	6.44
Sullivan & Strandberg, 1987	1977 1978 1979 1981 1982 1983 1984 1985 1986 1987	Oregon	Not Indicated	2.61 2.77 3.20 3.48 3.53 3.59 3.81 4.06 4.40 4.77
Hatoum, et al., 1988	1987	Hospital pharmacy	1	5.42
Schafermeyer, Schondelmeyer, & Thomas, 1990	1989	National Sample	695	5.46
Carroll, 1991a	1990	Virginia	35	5.17
Lamphere-Thorpe, et al., 1994	1991	North Carolina	214	5.37

The advent of computer software for prescription processing probably has lessened the time spent completing claim forms. On the other hand, the volume of third party prescriptions is increasing and may offset some efficiency achieved via computers in claims submission.

Participation in third party programs may slow the rate of cash flow for a pharmacy by tying up income in outstanding receivables payments. The capital cost of unpaid claims is a function of the dollar amount outstanding and the length of time the claims have been unpaid (Mason and Meyer, 1986). Rite Aid reported carrying cost per prescription of $0.10 associated with outstanding claims (Rite Aid Corporation Study, 1988). For chain pharmacies in 1989, the estimated carrying cost was $0.23 per prescription (Schafermeyer, Schondelmeyer, and Thomas, 1990). These costs can be significant when third party payers fail to reimburse pharmacies in a timely manner. Delayed reimbursement was demonstrated pointedly by Illinois' Medicaid program in 1991 where pharmacies had to wait over 5 months for reimbursement (Illinois Pharmacist Association, 1991). Over 90 pharmacies closed in Illinois that year, although there were no direct causal links established to the delayed Medicaid payments.

Cost-of-dispensing studies yield estimates of average costs that have been differentiated by prescription volume. Representing average costs by prescription volume indicates whether the market is operating at constant, increasing, or decreasing returns to scale (Reeder, 1987). Results from the retail pharmacy market have been mixed.

Cady (1975) analyzed 1970 data from the Lilly Digest for 3,183 chain and

independent pharmacies. He classified pharmacies by sales and prescription volume into 71 groupings. Total cost functions using total sales or cost-of-goods-sold were linear implying constant marginal costs. Average costs, however, as a function of total sales showed substantial economies of scale. Average costs varied directly with the sales ratio. Cady concluded that the retail pharmacy market operated with increasing returns to scale.

Lohrisch (1974) also found a linear total cost curve as a function of prescription output in his analysis of Lilly Digest data from 1972 on 1,374 independent pharmacies. His final Cobb-Douglas production function model was consistent with constant returns to scale. There was no functional relationship between average costs and the number of prescriptions dispensed. His conclusion was that retail pharmacies were not subject to economies of scale.

Based on 1991 data from North Carolina, Lamphere-Thorpe and associates (1994) showed that average dispensing costs declined as prescription volume increased. Pharmacies were classified by volume into three groups: less than 20,000, 20,001 to 40,000, and more than 40,000 prescriptions per year with respective dispensing costs of $6.78, $5.18, and $4.12.

Schafermeyer, Schondelmeyer, and Thomas (1990) reported a linear relationship between total costs and prescription volume in their analysis of chain pharmacies. As with Cady's data, this suggests constant returns to scale. They did not report average costs by prescription volume. A comparison of dispensing costs by the number of pharmacies under each chain ownership showed that costs were lowest for chains with

fewer than 100 outlets ($5.19) or greater than 1,000 outlets ($5.23). Intermediate sized chains (101-500 and 501 to 1000) had higher average costs ($5.59 and $5.89). This suggests diseconomies in the intermediate range of corporate size.

Reeder (1987) analyzed the cost structure of a representative, random sample of 54 retail pharmacies in South Carolina in a 1983 cost-of-dispensing study performed for the State Medicaid program. The regression coefficient on output for the linearized total cost function was 0.71 supporting the hypothesis of increasing returns to scale. The coefficient was significantly less than 1.0 ($t=4.83$, $p<0.05$), implying economies of scale. It followed that marginal costs were decreasing for the output range up to 80,000 prescriptions per year.

On a whole, the number of acquisitions and mergers in retail pharmacy, the growth in chain ownership, the decline in independent ownership, and an expanding market provide circumstantial evidence that economies of scale exist. Even though third party programs have increased operating costs, pharmacies are still able to achieve returns to scale. These points may explain why the largest corporations continue to acquire new units each year.

The other key component of the retail prescription industry cost structure is drug product acquisition costs. Ingredient cost usually accounts for the bulk of the prescription price. Prescriptions typically are reimbursed on a retrospective, fee-for-service basis. As a result of pressure from third party payers on limiting reimbursement for acquisition costs, pharmacies have turned to purchasing power in the form of volume discounts.

Firms under chain ownership can achieve buying advantages through the use of central warehouses and multiple distribution sites. They represent a large buyer and can negotiate discounts from manufacturers and wholesalers. Independent pharmacies have created buying groups to achieve similar cost advantages. Kreling and Kirk (1986) compared acquisition cost discounts for a stratified, random sample of independent and small chain (less than 10 units) pharmacies in Texas. There were no significant differences in primary wholesaler terms among 61 pharmacies grouped by prescription volume showing that pharmacies individually are not capable of exerting significant buying power. However, with independents turning to cooperative buying groups or purchasing cooperatives, volume discounts are more common for these pharmacies. Using a combined sampling of Wisconsin pharmacies and their wholesalers, Kreling (1990) analyzed acquisition cost differences on a number of variables. Most of the sample pharmacies were under independent ownership. Acquisition costs varied significantly by wholesaler, but the actual magnitude of the differences was approximately one percent for all but one wholesaler. Two of the wholesalers also served as vendors for two purchasing cooperatives. Fifty-seven percent of the sample pharmacies belonged to one of two cooperative buying groups. Membership in a cooperative was a significant predictor for the percent difference between actual and estimated acquisition costs. Buying groups offer a mechanism for independent pharmacies to lower their product acquisition costs.

Conduct

Conduct reflects how the market functions given its structure and basic conditions (Greer, 1980). Firms may establish pricing, promotion, or production policies as part of their competitive strategy (Porter, 1980). Their behavior is directed toward achieving some predetermined goal(s) such as efficiency, quality and profitability (Greer, 1980). To achieve their desired performance objectives, retail pharmacies must optimize pricing in two markets (cash and insured) and promotional strategies. The following sections contain discussions of issues and research related to these factors.

Price-Takers and Price-Makers

For the prescription department to exist with any type of customer, the general pricing structure must include the following: 1) the acquisition cost of the drugs, 2) costs incurred in dispensing or operating the prescription department, and 3) net profit or net margin. Summing the acquisition cost and the cost-of-dispensing provides the break even amount. The pharmacist must be able to regain this amount to avoid operating at a loss (Herman and Zabloski, 1978; Isetts and Hadsall, 1987; Smith, 1986). For the prescription department to continue services, it must secure a profit. The profit per prescription plus the cost-of-dispensing is often referred to as the dispensing or professional fee (Herman and Zabloski, 1978). Pricing decisions should take into consideration the basic philosophy of the pharmacy, its competition, and social and legal constraints (Smith, 1986).

The insured market is the collection of third party prescription service benefit

programs with which a given pharmacy contracts. Elements of the contract dictate the reimbursement formulas or schedules and any cost containment requirements for participating pharmacies. While pharmacists may use various methods to price prescriptions, third party payers typically choose to reimburse by estimating the product acquisition cost and adding a fixed dispensing fee. The dispensing fee presumably covers the cost-of-dispensing plus net profit. Retail pharmacies serve a number of third party programs with varying reimbursement schedules (Stone, 1985). The actual details of the contract and the number of enrollees along with their prescription usage undoubtedly determine how participation financially affects the pharmacy (Carroll, 1991b; Raisch, Larson, and Bootman, 1989).

For an individual pharmacy, it is easier to calculate how much the drug product costs. Third party payers, on the other hand, must estimate ingredient costs. Ingredient costs or product acquisition costs can be estimated using different cost bases such as average wholesale price (AWP) or wholesaler acquisition cost (WAC). The most available product cost information comes from AWP lists. Pharmacies are often able to obtain a discount from AWP through their wholesaler or buying group, or by buying directly from the manufacturer (Kreling and Kirk, 1986; Kreling, 1990). Through the use of purchasing discounts, it has been estimated that pharmacies pay 12% less than AWP (Kreling and Kirk, 1986). Most pharmacies use AWP in determining prescription selling prices, however (Stone, 1985; Kreling, 1987).

Actual acquisition cost (AAC) is the payment net of discounts and rebates

(Adams, Kreling, and Gondek, 1994). Estimated acquisition costs (EAC) usually assume some discount from AWP or a margin added to WAC. A comparison of discounts off of AWPs against WAC cost-plus computations found that AWPs often are 20% higher than WACs (Kreling and Kirk, 1986).

The third component of prescription prices is net profit. Net profit can be described as a means of compensating for the "financial risk that a pharmacy owner incurs in his investment in the business" (Proctor and Kirk, 1989, p. 54). Typical formulas add a fixed percentage to the average prescription charge (mark-up on selling price) or to the sum of the average dispensing cost and acquisition cost (mark-up on cost) (Herman and Zabloski, 1978). Net profit should be considered when assessing the adequacy of third party reimbursement or setting private pay prices.

The goals of reimbursement for prescription service benefits ideally should serve the best interests of beneficiaries in terms of providing adequate and appropriate access to medications. Third party payers attempt to control prescription expenditures while providers are trying to earn some target return on investment or other objective. The outcome of these tensions may depend upon relative levels of market power, e.g. oligopolistic vs. oligopsonistic. Beneficiary outcomes could be assessed in terms of access and quality.

Pharmacies seek reimbursement that recognizes their individual characteristics in a competitive environment. Noted differences exist in operating expenses, purchasing power, prescription volume, professional services, and ability to negotiate with third party

programs (Stark and Bowser, 1977; Reeder, 1987; Kreling, 1990). Third party programs seek reimbursement mechanisms that are easy to process and easy to control especially since prescription insurance plans generate a large volume of relatively small dollar claims (Knapp, 1971; Rodowskas, 1972). Reimbursement determined on an individual provider basis would be difficult for insurers to process and control, so they typically employ a standard reimbursement formula and apply it to all participating providers. This has led to concerns about the adequacy of reimbursement.

Adequacy of Reimbursement and Cost-Shifting

The concerns about reimbursement led Congress to mandate a study to determine the adequacy of reimbursement under Medicaid programs (Public Law 101-508). Congress was particularly interested in the effects reimbursement had on beneficiaries' access to prescription drugs. Under the subsequent contract from the Health Care Financing Administration (HCFA), Adams, Kreling and Gondek (1994) assimilated data from different sources. They estimated drug product acquisition costs for a market basket of drugs by State, region, and nationally. Additional adjustments to ingredient costs were made to account for variation in purchasing by type and size of pharmacies in each State. Dispensing costs were derived from a National average ($6.08) that was adjusted to State-level estimates using an index for variation in physician practice costs. State Medicaid payments for prescriptions simulated from the market basket were computed using the respective reimbursement formulas. Simulated payments nationally averaged 96% of

estimated costs. Twelve States paid more than estimated costs. Twenty States and the District of Columbia paid 95 to 99% of estimated costs. Maryland had the lowest ratio at 84%. In estimating costs, however, the authors excluded net profits.

When reimbursement is inadequate, several results have been hypothesized. The first is cost-shifting. The argument goes as follows. When reimbursement from one group of payers is not adequate, e.g. fails to cover costs, the pharmacy is forced to charge other payers more to recoup the losses (Stone, 1985; McMillan, 1989). Adequate reimbursement implies that all of the costs associated with dispensing the prescription, including acquisition costs, operating expenses, and net profit, have been covered. Given that third party prescriptions generate higher administrative costs than private pay prescriptions (Health Information Designs, 1979; Schafermeyer, Schondelmeyer, and Thomas, 1990; Carroll, 1991a), inequity arises when identical or lower fees are paid by third party plans relative to private pay customers. In practice, private pay patients are charged significantly more for identical prescriptions than third parties reimburse (Stone, 1985; McMillan, 1989). By charging the private pay customers more, the pharmacy can recoup any losses from the administrative burden of third party payments.

Cost-shifting in pharmacy has been investigated in two major studies. The first was a 1984 analysis of a national sample of independent and chain community pharmacies (Stone, 1985). Stone's model was based on an all-payer rate formula whereby all payers in the market should pay identical prices. Third party reimbursement led to an average cost-shift subsidy of $0.48 per private pay prescription. The amount of the cost-

shift increased as the percentage of prescriptions covered by third party programs increased. The cross-subsidy was $0.10 per prescription for pharmacies with less than 20% of all prescriptions covered by third party plans. For pharmacies with 20-39.9% and more than 40% third party proportions, the subsidies were $0.33 per prescription and $0.68 per prescription, respectively. In his pilot study of Indiana pharmacies, Stone (1985) found a cross-subsidy of $1.83 per prescription for pharmacies with more than 50% of prescriptions covered by third party plans.

McMillan (1989) argued that differential pricing is not solely an indicator of cost-shifting as Stone hypothesized. Some of the payment differentials could be due to price discrimination. Identifying separate markets would encourage price discrimination especially in the cash market. In order for a pharmacy to increase its prices to private pay customers, they must have some characteristic that makes their demand for prescription medications very inelastic. The ability to price discriminate would be limited by competition in the local market, however. McMillan went on to argue that to support the cost-shifting theory, there must be evidence that higher private pay gross margins have a positive relationship with an increasing third party prescription volume proportion.

McMillan (1989) obtained a sample of over 1.6 million prescriptions dispensed by 650 Georgia pharmacies during November 1988. Gross margins for Medicaid and private third party programs were significantly lower than private pay gross margins. The ratio of third party to total prescription volume was positively related to private pay gross margins, also. Medicaid proportions were significant for independent pharmacies, while

private third party proportions were significant for chains. The estimated average cost-shift subsidy per prescription was $0.49 for chains as a result of private third parties and $0.20 for independents as a result of Medicaid.

Other possible outcomes of inadequate reimbursement are reduced profitability of the pharmacy, increased gross margin on nonprescription items in the pharmacy, and reduced salaries for the pharmacy managers (Pathak, 1982). To date, these outcomes have not been assessed in the literature. Over time, if significant shortfalls in reimbursement occur, pharmacies may be forced out of business financially or may be forced to discontinue serving third party beneficiaries. Thomas' (1983) survey of owners found that the proportion of prescriptions dispensed to insured customers was not related significantly to closure or changes in ownership. At the time, though, the average proportion of third party prescriptions was 34.2% for the study population. As the cash market shrinks in retail pharmacy, firms will be unable to capture as much of the cross-subsidy from cash customers. Presumably, continued price increases will drive cash customers to lower priced competitors or out of the market entirely.

Advertising

In addition to pricing, promotional policies are another form of conduct in industries. Advertising is one mechanism firms can use to increase sales and attempt to garner a greater market share (Greer, 1980). The effects of advertising may be the most influential in consumer, experience goods markets sold through convenience outlets, such

as retail pharmacies (Porter, 1974; Greer, 1980). Advertising of experience goods, defined as goods that must be used before they can be judged, is expected to influence demand by creating the impression that the products are better buys (Martin, 1988). The empirical evidence on the relationship between advertising and profit has been inconclusive, though (Greer, 1980). For retail industries, the relationship may be weak and negative (Boyer, 1974). Porter (1974), however, found advertising to sales ratios as significant predictors of profit rates across convenience, consumer goods industries, including drugs. Greer (1980) maintains that advertising in drug retailing is beneficial.

Boyer (1974) argued that advertising by manufacturers (goodwill) has a positive effect on profitability. On the other hand, advertising by retailers serves to provide information and has a negative impact on profits. He supported his argument with empirical data from 41 manufacturing industries and 21 retailing industries, including retail drug stores. While Porter and Boyer included drugs as a retail market, by comparing several retailing industries they may have masked the effects of advertising within the retail drug industry.

Cady (1976) estimated the social cost of prescription price advertising restrictions. States that restricted prescription price advertising had retail prices that were 2.9% higher. The restrictions generated estimated monopoly revenues of $135 to $152 million. These excessive prices certainly should have led to higher profits for firms in the industry, unless they caused a simultaneous decrease in volume.

Promotion attempts to attract and maintain customers. Pharmacies use promotion

for non-prescription and prescription items with a greater concentration on non-prescription merchandise. They also use a wide variety of media for advertising: e.g. newspaper inserts, radio, television, in-store displays. Retail pharmacy newspaper advertisements have been shown to contain product information (42.4%), service information (26.3%), or a combination of the two (31.3%) (Paulson and Wiederholt, 1993). Although this study was limited to a single, Midwestern city, it is the only published analysis of retail pharmacy advertising content.

As argued before, the cash market likely to be influenced by prescription advertising is shrinking. Advertising is not likely create new demand for prescription drugs in the retail market. However, firms can use advertisements to inform the public about the availability of pharmacy services (Paulson and Wiederholt, 1993). Prescription price advertising should increase sales but lower prices. The impact on prescription department profits is ambiguous.

So far, this review of the retail pharmacy industry has highlighted a few key points. First, retail pharmacies face two distinct markets. In one they are price-takers, subject to reimbursement formulas developed by third party service benefit programs. In the other market, they are able to set prices, but this market is shrinking. Market power in retail pharmacy is increasingly important. The larger, consolidating firms are able to capitalize on volume discounts in purchasing and lower costs with increasing returns to scale. These firms potentially will erode the cash market share of smaller pharmacies and garner market power for negotiating with third party programs. Advertising is a strategy

for attracting and retaining customers, but its effects on profits may be weak and negative. It remains to be seen how effective pharmacies have been in using these factors to their advantage in generating profits. The next section discusses studies of performance and describes the model for the market for retail prescription services.

Performance of the Retail Pharmacy Market

Industry performance is the final output or measure of how well firms accomplished their objectives given their basic conditions, structure, and conduct (Greer, 1980). Of interest in this review are studies on the profitability of the retail pharmacy industry, specifically, the prescription department profits. A few studies have analyzed performance in the retail pharmacy industry using *Lilly Digest* data as an indicator of pharmacies' profits. Unfortunately, the data are based upon a self-selected sample of independent pharmacies that may not be indicative of true practice. In addition, the figures for net profit are reported for the entire outlet and not for the prescription department.

Rossiter (1977, 1982) tested the applicability of the profit-maximizing assumption with a duopoly model to the retail prescription market. Using a simultaneous equations model in the first analysis, he found that pharmacies were not profit-maximizers or cost-minimizers because they underemployed pharmacy aides (Rossiter, 1977). One reason for underemployment, however, was a State restriction on the pharmacy aide to pharmacist ratio and such restrictions still exist in many states. Although this restriction

imposes a constraint on profit maximization, it does not necessarily imply that profit maximization is not an appropriate assumption.

The U.S. Bureau of the Census regularly publishes data on the business activity of retail sectors. Data on purchases, gross margins, and gross margin percentages for the retail drug and proprietary stores for 1984 through 1992 are displayed in Table 5 (U.S. Bureau of the Census, 1994a). Trends in the data remarkably reflect changes in industry growth. The maximum number of retail pharmacy outlets occurred right after gross margins hit a maximum. Since then the industry has consolidated, the insured market has expanded, and gross margins as a percent of sales have fallen. As with other data, however, these figures only show trends in overall pharmacy store margins, not prescription department margins.

One study has distinguished prescription from non-prescription department profits. Berger and Pearson (1986) collected data from a random sample of 241 Alabama community pharmacies. Prescription department profits contributed more to overall pharmacy profits than non-prescription merchandise. For pharmacies that operated with a net profit, prescription department gross margin averaged 37.5% versus 28.4% for the front-end. Pharmacies operating at a net loss had gross margins of 29.6% for prescriptions and 27.3% for non-prescriptions. Only 64 pharmacies had profitable front-ends. A greater proportion of chain pharmacies (74.1%) had profitable front-ends than independent (21.3%), independent-discount (21.4%), and professional (13.6%) pharmacies. Over 50% of the pharmacies were operating at a net loss overall. The results

of these kinds of studies are affected heavily by allocation bases and cost-of-dispensing formulas. This study reveals that pharmacies do rely heavily upon the prescription department in turning a profit. The next step is to examine how capable pharmacies are of turning a profit given third party participation and competition.

Table 5. Census Bureau Data on the Retail Drug and Proprietary Industry, 1984-1992

YEAR	ESTIMATED PURCHASES (Millions)	ESTIMATED GROSS MARGIN (Millions)	GROSS MARGIN PERCENTAGES (Percent of Sales)
1984	$31,546	$13,085	29.7
1985	32,972	14,846	31.6
1986	36,261	15,216	30.1
1987	38,424	16,144	29.8
1988	41,789	16,555	28.6
1989	45,846	18,940	29.8
1990	51,034	20,758	29.3
1991	55,051	21,891	28.8
1992	56,972	21,053	26.9

Source: U.S. Bureau of the Census, 1994a

Model of Retail Prescription Services

A model of the market for retail prescription services is needed to assess pharmacies' performance. The foregoing argument sets the course for disaggregating the retail prescription market into distinct segments (e.g. prescription department and non-prescription merchandise). Such distinctions may assist in understanding a given

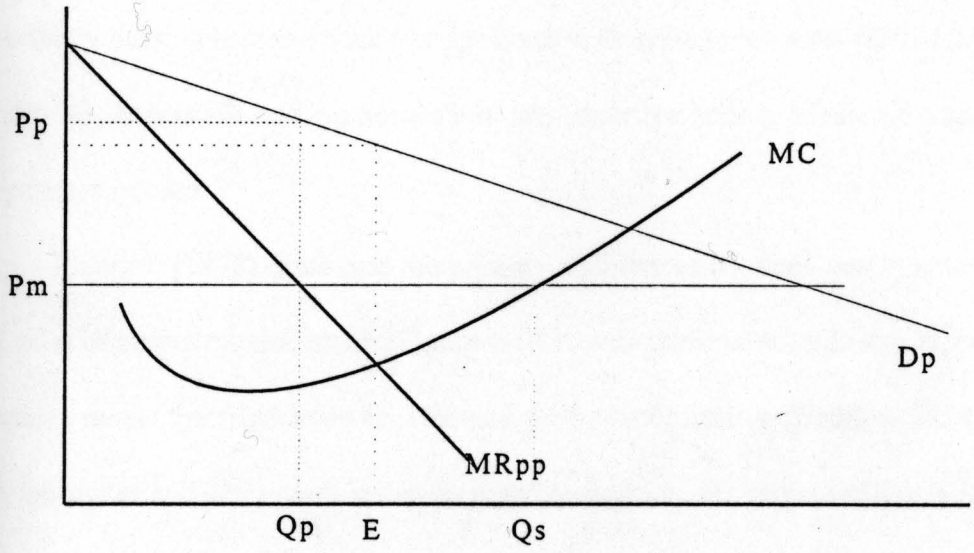
pharmacy's performance. In order to understand how or why pharmacies make certain decisions in their markets, two models from other health care markets will be discussed. These models for the physician services and nursing home markets have been developed with recognition of two types of payers and serve as a source for developing a similar model for the retail prescription market. A distinction is made between the models on the basis of their underlying assumptions. The first model rests upon the traditional profit maximization assumption while the second model assumes output maximization. Either model can serve to generate the same set of variables of interest when looking at elements of the market that affect profitability. The output maximization hypothesis is included because it provides a reasonable model for explaining why retail pharmacies may not operate in a manner consistent with maintaining optimal profits, namely, why do pharmacies accept third-party contracts that reimburse poorly.

Physician Services and Nursing Home Markets

Feldstein (1988) assimilated a number of empirical articles into a model analyzing a physician's decision to accept Medicare assignment (Figure 2). (For empirical work, see Hadley, 1979; Yett, Der, Earnst, and Hay, 1981; Sloan, Mitchell, and Cromwell, 1978; and Sloan and Steinwald, 1978.) In a market with cash clients only, a profit-maximizing physician would produce the quantity at which marginal costs equal marginal revenue (E). When the market is divided between cash paying customers and Medicare beneficiaries, the physician becomes a price-taker for Medicare patients with price set at Pm. If the

Medicare reimbursement is greater than the intersection price at marginal cost equal to marginal revenue, the physician will accept Medicare until the Medicare prices equal marginal cost (Qs). The number of services provided to the cash market falls from E to Qp. Similar arguments have been advanced regarding participation in Medicaid and private insurance programs (Yett, Der, Earnst, and Hay, 1981; Sloan, Mitchell, and Cromwell, 1978; and Sloan and Steinwald, 1978; Hadley, 1979).

Figure 2. Model for a Profit Maximizing Provider



Source: Feldstein, 1988

Two models of conduct have been postulated for the nursing home market. For-profit homes are expected to be profit-maximizing while non-profit homes are expected

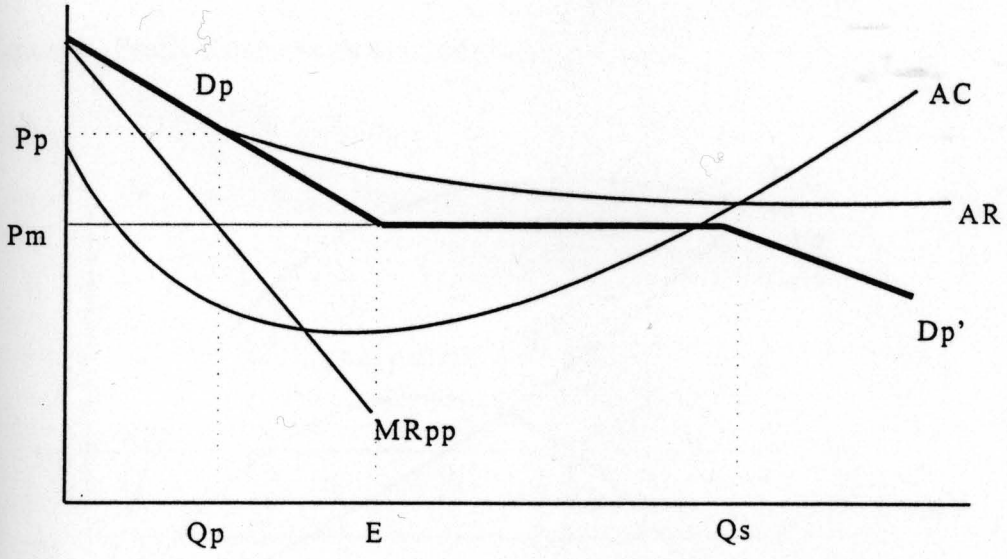
to be output-maximizing (Scanlon, 1980). Proprietary nursing homes should supply private pay beds until the marginal revenue from private pay patients equals the Medicaid price as in the preceding figure. The remaining beds will be sold to Medicaid patients. The acceptance of private-pay patients before Medicaid patients creates excess demand among Medicaid recipients as shown by Scanlon's empirical evidence.

The alternative theory for nursing homes was developed to explain non-profit homes' behaviors. Since these firms are not profit-maximizing, Scanlon (1980) assumed they would operate to maximize their size (Figure 3). Output maximization would be constrained by quality and no economic losses. First order conditions imply that non-proprietary nursing homes equate average costs with average revenues (Qs). Under these conditions, non-profit nursing homes will provide more beds to Medicaid patients than proprietary homes.

Baumol (1958) discussed the primary differences between profit maximization and sales or output maximization (Figure 4). Sales maximization leads to a higher output (Qsales versus Qprofit) at a lower price than profit maximization (Baumol, 1958). Costs may be higher and output will be below pure competition, but social welfare is improved as compared to profit-maximization (Baumol, 1958; Yeung, 1974). Even though profit may be lower than under profit-maximizing behavior, firms are expected to operate with a minimum desired return on investment (Baumol, 1958). Sales maximization under oligopolistic behavior can coincide with profit maximization (Greer, 1980). Presumably, a firm could increase its price, for instance from P1 to P2, and increase their profits

although they would lose volume. There must be sufficient heterogeneity in the products, however, for the firm to charge higher prices without losing their client base. Advertising and service expansion are two methods used to generate product differentiation to achieve this heterogeneity.

Figure 3. Model for an Output Maximizing Provider

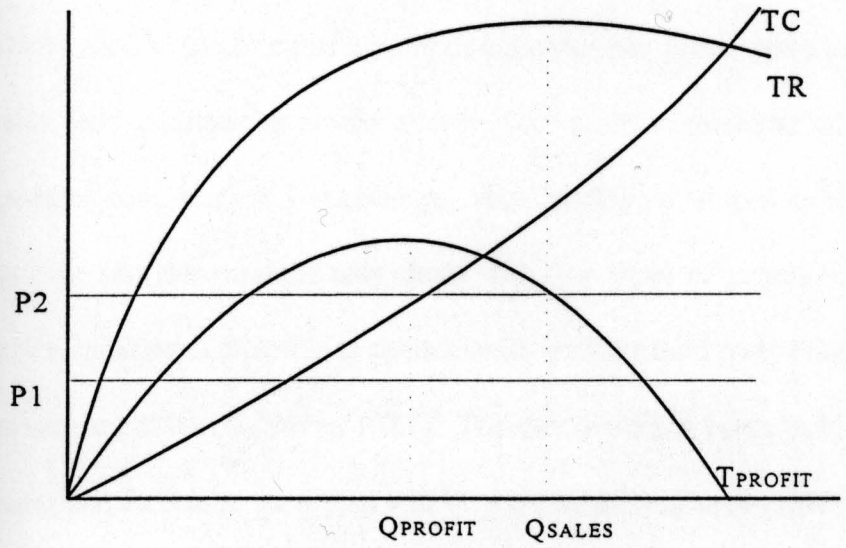


Source: Scanlon, 1980

Sales maximization has an intuitive appeal because it is based upon the behavior of managers, not the executive officers' conduct. Managers operate firms on a daily basis, and they often rely upon sales figures and averages to guide their conduct. Achieving the largest possible volume can translate into higher managers' salaries or

greater discretionary power for managers (Martin, 1988). As long as they generate some minimal level of profits, e.g. to make shareholders happy, they continue to make decisions with sales or output as primary concerns. Even independently owned pharmacies may operate under these assumptions. Independent owners may seek maximum volume and sufficient profitability to live comfortably evidenced when they earn salaries lower than market wages for pharmacists.

Figure 4. Profit Versus Sales Maximization



Source: Baumol, 1958

Retail Prescription Market

Since the market has been explicitly segmented by the various third party

programs, the pharmacy can readily identify its cash customers (McMillan, 1989). Pharmacies set prices in the private pay market to some extent. So long as the cash market has more inelastic demand than the third party markets, pharmacies can set private pay prices higher. McMillan (1989) demonstrated this effect by showing that prices are higher in the cash customer market than the third party market.

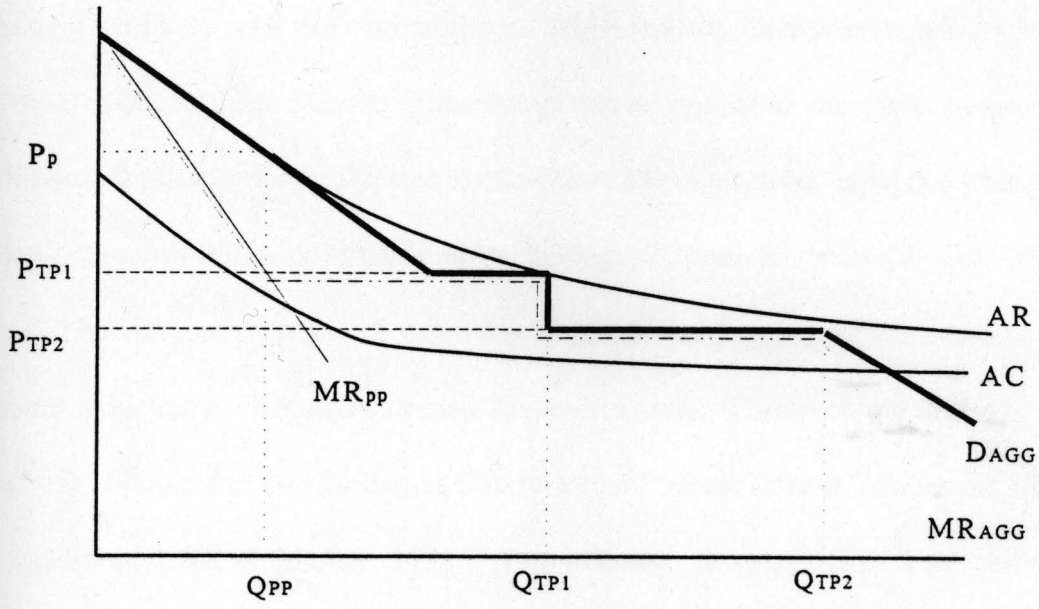
Drawing from the theoretical arguments presented for the physician services market, profit-maximizing pharmacies should provide output up to the point where marginal revenue equals marginal cost (Figure 2) (McMillan, 1989). Output-maximizing pharmacies would provide output up to the point where average revenue equals average cost (Figure 3). Under either assumption, private pay prescription prices would appear to rise, and pharmacies would accept third party reimbursement that covered the respective cost, marginal or average. The models developed in nursing homes and physician services markets only dealt with two types of payers simultaneously. In practice, most retail pharmacies contract with multiple third party programs with varying reimbursement levels (Stone, 1985). The theory readily extends, however, by way of arguing that each third party plan will be accepted as long as reimbursement covers cost.

To illustrate this market with multiple payers, the output maximization model is used. Using the nursing home model, output maximization implies that pharmacies will produce up to where average cost and average revenue are equal (Figure 5). The model is slightly more complicated as more payer levels are added. Two payers (TP1 and TP2) are shown in addition to the cash market. The pharmacy should supply the quantity

associated with the highest possible marginal revenue for each payer type. For instance, the pharmacy will supply Qpp to the cash market by following the marginal revenue curve (MRpp) until it intersects the marginal revenue for the first third party payer (P_{TP1}). The pharmacy will then supply up to Q_{TP1} to this payer. At that point the pharmacy will select the next highest marginal revenue curve, e.g. the next level of third party payment (P_{TP2}). (The gap between P_{TP1} and P_{TP2} would be filled in by cash prescriptions although this is not depicted in the figure.) The aggregate marginal revenue (MR_{AGG}) and demand curves (D_{AGG}) are displayed as stair-stepped curves. As pharmacies sign third party contracts, they may be required to accept all prescriptions for beneficiaries. If the size of the plan extends beyond the optimal output level, the pharmacy will lose profits. In addition, any third party reimbursing at levels below the intersection of average cost and average revenue should be denied.

The slope of the average revenue curve (AR) will reflect the relative reimbursement level of each payer in the market, the output for each level, and the product mix within each market (Carroll, 1991b; Raisch, Larson, and Bootman, 1989; Kotzan and Carroll, 1991). As third party payers use greater discounts from AWP to determine acquisition costs (and/or lower dispensing fees per prescription), the margin from each unit of output declines (Carroll, 1991b). Margins also decline as the proportion of third party prescriptions increases (Carroll, 1991b). Product mix variation by payer type reflects different prescription ingredient costs associated with providing prescriptions for each market (Kotzan and Carroll, 1991).

Figure 5. Output Maximizing Retail Pharmacy



Average revenue from the private pay market depends upon the level of output (Qpp) and reimbursement (Pp). Competition between pharmacies located in the same market, however, forces the level of reimbursement in the cash market to fall limiting the degree of price discrimination pharmacies can exercise. The failure of competition variables to explain significant variation in prescription margins in previous studies (McMillan, 1989; Norwood and Gagnon, 1974) could be due to inadequate measurement or may reflect a high level of existing competition in the market.

An additional tool to describe the behavior of pharmacies is game theory. Game theory views interactions between firms in a market as a series of contests where each

firm's decision is an attempt to select the best strategy for maximizing their desired outcome, e.g. profit or output (Scherer and Ross, 1990). At the same time, the pharmacy considers the likely response of rival firms. While initially developed to solve pricing decisions in oligopolistic markets, game theory can be applied to non-price competitive decisions. Applications to health care markets have been discussed, using two examples of non-price competition, advertising and technology, between hospitals (McKay, 1994).

The simplest example of game theory is the classic prisoner's dilemma. (The prisoner's dilemma is discussed in most economics texts. Therefore, the details of the game will be limited in this discussion. For further reference, refer to Scherer and Ross, 1990; Varian, 1993; or McKay, 1994.) Two prisoners must optimize their expected prison terms for a joint crime without knowing whether their accomplice will confess. Both prisoners make decisions that prove to make them worse off than if they had been able to cooperate. Similarly, in health care markets, the prisoner's dilemma leads providers to make decisions, such as advertising, the adoption of new technology, or the duplication of services, that leave them worse off financially, e.g. lower profits, than if they had cooperated (McKay, 1994). Of course, cooperation between competitors raises concerns of collusion or anticompetitive behavior.

The case of third party contract decisions as non-price competitive strategies can be modeled using this simple form of game theory. Pharmacies must compete for market share since the market for prescriptions is fixed in the short run, which is referred to as a zero-sum game (Scherer and Ross, 1990). The decision to participate in a third-party

programs is therefore a form of non-price competition. Suppose there are two pharmacies in a given market, each facing the decision of signing a contract with the same third party payer (Figure 6). The contract lasts for a single year and involves 20% of each pharmacy's existing clientele. Since these are the only two pharmacies in the market, if one firm declines and the other accepts, the latter pharmacy automatically will acquire all contract enrollees. Assuming that pharmacies are output maximizing, they will choose to accept the contract to maintain or potentially increase their prescription volume.

Figure 6. Third Party Contract Decisions Using the Prisoner's Dilemma

		Pharmacy 1	
		Accept Contract	Decline Contract
Pharmacy 2	Accept Contract	Phcy 1: 100RXs/day Phcy 2: 100RXs/day	Phcy 1: 80 RXs/day Phcy 2: 120RXs/day
	Decline Contract	Phcy 1: 120RXs/day Phcy 2: 80 RXs/day	Phcy 1: 80 RXs/day Phcy 2: 80 RXs/day

Although accepting the contract in this game achieves the pharmacy's goal of maximizing its output, the impact on its profit margin requires analyzing several pieces of information as already noted in the maximization models (Carroll, 1991b). The primary concern of pharmacy owners/managers is how prescription volume would be

affected since the market for prescriptions is relatively fixed in the short run. Since buying and operating efficiencies are volume based, most have accepted third party contracts simply to keep their volume as high as possible. More recently, pharmacists anecdotally have declined contracts based upon insufficient reimbursement. In these cases, the pharmacists seem to have decided that the financial losses associated with participation outweigh any volume gains. The minimal acceptable level of reimbursement is probably based upon a comparison of average costs and revenues as suggested by output maximization.

If both pharmacies independently assessed the economic impact of the contract and declined it, the payer would be forced to find an alternative means of providing access to medications for their enrollees. Two possible options are contracting with an outside source, such as a mail order pharmacy, or renegotiating the contract at a higher level of reimbursement with the two pharmacies. In the latter case, the cooperation between the pharmacies could improve their respective lots. On the other hand, the mail order contract would erode their client base except for acute care prescriptions.

Advertising is another classic application of game theory. For some markets, the amount of resources a firm invests in advertising, a form of non-price competition, is thought to be important for maintaining market share. Based on the prisoner's dilemma, firms are apt to advertise at a level that is higher than they would if they were able to cooperate (McKay, 1994). Since price is often removed from the demand functions of health care goods and services due to extensive health insurance coverage, including

prescription medications, advertising becomes a necessary method to maintain market share (McKay, 1994).

In the case of retail pharmacy, advertising is potentially important to maintain market share in a fixed size market (Scherer and Ross, 1990). The game plays out the same as the third party contract decision with both pharmacies advertising at a higher level than would be optimal. Not all of the empirical literature on pharmacy advertising, albeit limited, supports this game. The problem may rest with the assumption that advertising prescription goods and services will increase sales and garner greater market share.

The purpose of this project is not to test whether retail pharmacies are profit maximizing or output maximizing. The discussion of the output maximization hypothesis illustrates a competing theory that more intuitively reflects the behavior of retail pharmacies. Combined with game theory, it provides arguments as to why pharmacies may engage in behavior that fails to maximize their profits. Using either the profit maximizing diagram in Figure 2 extended to multiple payers or the output maximization model depicted in Figure 5, one can identify the variables most likely to predict profitability.

Background research suggests that economies of scale exist in the retail pharmacy market. These economies arise from volume discounts for purchasing (acquisition costs) and distribution of high fixed costs across greater volumes (operating costs). Prescription volume reflects the demand for a given pharmacy's prescription products. Demand is

dependent upon a number of contingencies in the local community such as population size and morbidity and number of prescribers. The basic view, though, is that the level of volume passing through a given pharmacy affects the options for competitive strategies. For instance, lower volume pharmacies will have fewer options to maintain a viable prescription department. Operating costs, acquisition costs, and prescription volume are known to influence profitability and therefore will be entered into the statistical models as control variables.

The impact of third party programs is reflected in the relative proportion of each pharmacy's market that is controlled by these contracts. As the proportion increases, pharmacies have less control over their prices. Given the differences in product acquisition costs by payer type and the differential rates at which private and public payers reimburse, these components of the market should be separated (Mott, 1995; Kotzan and Carroll, 1991; Stone, 1985; McMillan, 1989).

Competition will be assessed with three variables. The first is advertising which should stimulate demand for a particular pharmacy's prescription products. Shifting the demand curve upward should improve profitability, although game theory suggests that pharmacies will advertise too much. The second competition variable reflects each pharmacy's pricing policy. As the size of the cash market declines, competition for cash customers is expected to increase. This will cause a downward pressure on the demand curve and cause private pay prices to decline. Examining the private pay gross margins on a set of prescriptions is an attempt to capture this downward pressure. The final

competition variable considered is the number of competing pharmacies within the local market. As the number of pharmacies increases, one would expect more intense competition.

The model for retail pharmacy services developed in this section demonstrates some of the factors predicted to influence profitability most directly. With this framework, the following research hypotheses are stated and subsequently evaluated to determine the impact of third party programs and competition on prescription department profits.

Hypotheses

Although the impact of third party participation and competition were the variables of primary interest, past research had demonstrated that other factors undoubtedly influenced a pharmacy's profits. These factors had to be controlled for before testing the primary variables. Purchasing and operating efficiencies were thought to improve profitability. In fact, profit maximization can be stated as cost-minimization. Therefore, purchasing and operating costs were incorporated into the model. In addition, volume was accounted for as a means of capturing the demand for prescription drugs in the local market.

Third party participation was expected to have a negative impact on prescription department profits due to restricted reimbursement. Given the differences in product acquisition costs by payer type and the differential rates at which private and public

payers reimburse, these components of the market should be separated (Mott, 1995; Kotzan and Carroll, 1991; Stone, 1985; McMillan, 1989).

H1: As the proportion of prescriptions paid for by Medicaid increased, prescription department profits would decrease.

H2: As the proportion of prescriptions paid for by private third party payers increased, prescription department profits would decrease.

Competition is a factor that has not been shown to affect pharmacies' conduct. This may be due to a variety of reasons including inadequate measurement and lack of variance in pharmacies' behavior. The following variables were considered in this study as alternatives to previous competition measures with the predicted relationships stated as research hypotheses.

For the portion of the market where pharmacies can set prices, one would expect firms to attempt price discrimination. Pharmacies were expected to set cash prices such that they extract profits without driving customers away.

H3: As private-pay gross margins increase, prescription department profits would increase.

The goal of advertising is to increase the customer base and ideally to improve profitability. Game theory suggests, though, that pharmacies may advertise too heavily, so advertising was expected to have a negative effect on prescription department profits.

H4: As the prescription department advertising expense increases, prescription department profits would decrease.

To test the impact of competition within the local trading area on profits, the number of pharmacies within a five mile radius was expected to affect prescription

department profits.

H5: As the number of competitors in the local trading area increased, prescription department profits would decrease.

Lastly, the model suggested there may be an interaction between participation in third party programs and competition. In order to look at the entire market, the third party and competition variables were included in the same model. The final hypothesis tested the simultaneous inclusion of competition and third party variables and their impact on profitability. Each of the foregoing predictions was expected to hold in this final model.

H6: Increasing competition and third party participation will decrease prescription department profits.

CHAPTER III

METHODS

The preceding discussion concluded with the development of a model to evaluate the performance of the retail pharmacy industry given factors reflecting its environment, structure, and conduct. The methods used to test hypotheses of the expected relationships between those factors are described below.

Sample

The model and attending hypotheses were evaluated in a stratified, random sample of retail pharmacies from the lower two-thirds of Wisconsin. The sampling frame was drawn from the 1995 edition of the Hayes' Druggist Directory with pharmacies grouped by county (Hayes, 1995). Retail pharmacies located in the northern counties were excluded due to the sparseness of the population and feasibility issues.

The sampling frame was stratified into a 2x2 matrix reflecting two levels of competition and two levels of prescription insurance coverage. High and low levels of prescription insurance were determined by analyzing the distribution of state employee benefit plans across Wisconsin. The assumption was made that the State was the largest employer, and since all state employee benefit plans included a service prescription drug benefit, their distribution would reflect the distribution of private plans. The number of plans per county was obtained from the 1995 health benefit plan descriptions (Department

of Employe Trust Fund, 1994). Counties with high levels of insurance had four or more state employee benefit plans, and low levels of insurance had three or fewer plans. Stratification by competition was based on the number of pharmacies per county. Counties with fewer than twenty pharmacies were classified as low competition, and likewise, counties with more than twenty pharmacies were classified as high competition.

Several counties were excluded because of known characteristics that were inconsistent with the stratification variables. For example, large private corporations provided insurance benefits in these counties making the distribution of State benefit plans an underestimate of the actual proportion of prescriptions covered by insurance. Other counties classified as low competition were excluded because they were located near large metropolitan areas or highly competitive counties. One county was excluded due to concerns of overburdening pharmacy providers in the proximity of the research institution. Appendix A lists the counties excluded and included in the sampling frame.

Sample size was estimated using two techniques. The model was to be tested using multiple regression, so the first estimate was based upon generating 5 to10 subjects per regression predictor (Kleinbaum, Klupper, and Muller, 1988). With 6 predictors, a minimum of thirty pharmacies were needed for analysis.

The second estimate was an effect size estimation based upon pharmacy profitability. In a published study, net profits of prescription departments were analyzed in a sample of pharmacies classified according to five sales levels (Berger and Pearson, 1986). The two smallest sales levels ($0-235,000 and $235,001-310,000) were assumed

to coincide with pharmacies in the counties with fewer than 20 pharmacies, the low competition category. The three larger sales categories ($310,001-400,000; $400,001-600,000; $600,001 and above) were assumed to represent pharmacies located in counties with high levels of competition. The pooled average net prescription profit as a percent of total sales was 0.68% and 3.97% for the smaller and larger sales categories, respectively. Since the authors did not include standard deviations, the range of net prescription profit percentage (-2.25% to 6.03%) was divided by six to get a rough estimate of a standard deviation (1.38). The estimated standardized contrast or effect size was the difference between profit levels for the small and large sales categories divided by the standard deviation estimate (Levin, 1975).

Effect size = (3.97 - 0.68)/1.38 = 2.38.

Using a power level of 0.90 (beta = 0.10) and alpha (2-tailed) of 0.05, the sample size calculation follows:

n = [2(z1-z2)sq]/(effect size)sq (Levin, 1975).

Where,

z1=z(1-0.05/2)=z(0.975)=1.96,

z2=z(0.10)=-1.28.

So, n=3.71 or a minimum of four subjects per group. Therefore, for the distinction between counties with high and low levels of competition, only four pharmacies per group would be needed. Since the requirements for regression modeling called for a larger sample, the minimum of 30 was used. To balance the 2x2 stratification matrix, a

final sample size of 40 was chosen. The pharmacies for the counties in each cell of the stratification matrix were pooled, and a random sample of 10 drawn from each pool.

Data Collection Procedure

Each sampled pharmacy was sent a letter describing the project and soliciting participation. The letter was followed up by a telephone contact to verify the proper contact person, describe the project, answer questions, and determine willingness to participate. Those agreeing to review the survey and consider participation were sent a copy of the instrument and instructions (Appendix B). Pharmacies that declined participation were replaced with a different, randomly selected pharmacy. Non-response bias was assessed using three items of information to compare to participating and national averages: average daily prescription volume, proportion of prescription volume reimbursed by Medicaid, and proportion of prescription volume reimbursed by all third-party payers. This information was solicited at any point in the process when a pharmacy declined further participation. Pharmacies could decline participation at any point during the study. Additional non-response bias variables, location and number of competitors, were drawn from secondary data sources.

Corporate-owned and independently owned pharmacies were pooled together in the sampling frame. In the case of independent-owned and small or regional chains if only one from that chain was selected, the relevant owner/manager was contacted. In the case of larger corporations or chains that had two or more pharmacies selected in the

sampling, the regional manager initially was contacted.

Data collection occurred in two phases. The first phase was a self-report format which was followed by an on-site visit (Berger and Pearson, 1986). Part I of the survey included questions related to the owners'/managers' perceptions of competition and decision-making criteria related to third-party participation. Owners and managers were asked to complete Part I prior to the site visit. During the site visit, Part II of the survey was completed by the researcher. Specific financial data taken directly from internal financial and operating documents was collected in Part II. Owners/managers were asked to have the following items ready for the site visit to complete Part II: income statement from the most recently completed fiscal year, purchase invoices for all prescription drug sources for a one month period, and third-party reconciliation reports from the largest payers (defined as greater than 5% of prescription volume) for a one month period. Prices were solicited for a market basket of ten products for prices current at the time of the site visit. In some cases, the owners/managers had completed part or all of Part II. The researcher reviewed Part I on-site to clarify or complete missing information.

The survey instrument was created from cost-of-dispensing surveys, notably the instrument employed by Schafermeyer, Schondelmeyer, and Thomas (1990). It was reviewed by three pharmacy owners for clarity of items and feasibility, and their comments were incorporated. The full data collection procedure using the revised instrument was pilot tested at two pharmacies. Further modifications were made. A copy of the final instrument is exhibited in Appendix B. All data were collected for the most

recently completed 12-month fiscal period, except for prices, acquisition costs, and third-party reimbursement. Prices were taken from the day of the site visit. Acquisition costs and third-party reimbursement figures were taken from January 1995 or a single one month period if January data were not available.

Variables

The dependent variable, predictors, and control variables are listed and defined in Table 6. The control variables, prescription volume, prescription labor expense, and average acquisition costs were included to factor out the effect of economies of scale. All three are market structure variables. The impact of third-party participation and competition was evaluated after the control variables were placed in the model. These predictors reflect the environment and conduct of firms given their market structure.

Dependent Variable

Prescription department net profit was the overall performance measure of interest. To compute prescription department net profits, gross margin was taken directly from the income statement figures and overhead expenses were allocated to the prescription department. Labor expense was collected in a manner that allowed for allocation on the basis of time spent performing prescription related activities. Delivery, computer and advertising were expensed directly if possible. The remaining overhead expenses were allocated using the prescription to total sales ratio. The net profit in dollars

for the prescription department was divided by the prescription department sales to get the net profit proportion. Given the sensitive nature of this measure, an index was developed where the average net profit proportion across the sample served as the base equal to 1.0. (This method of indexing was used to encourage more pharmacies to participate.) Net prescription department profits for each pharmacy were converted to the indexed value (PPRFIN).

Independent Variables: Basic Conditions

Prescription volume was considered an environmental variable reflecting the demand for prescription drugs from each pharmacy or as a structural variable reflecting the size of the seller and the achievement of economies of scale. Since the cost conditions are being used to capture market structure, prescription volume was an environmental variable in this model. The profit-maximization hypothesis suggests that as volume increases so will profit. The output maximization hypothesis, however, suggests that the relationship will be quadratic, e.g. profits will rise, then fall as output expands. In general a positive relationship is predicted between profit and prescription volume. Prescription volume was measured as the total number of prescriptions dispensed in a one-month period (JANTOT). January was intentionally selected because that it typically is the busiest month in any given pharmacy.

Table 6. Variable Definitions

VARIABLE CATEGORY/NAME	DEFINITION
Dependent Variable:	
PPRFIN= indexed prescription department profits	Difference between prescription department gross margin and estimated prescription department overhead expenses indexed to the sample mean
Control Variables:	
JANTOT=prescription volume	Total number of prescriptions dispensed in January 1995
AVGAAC=average actual acquisition cost	Average invoice or sticker cost for a market basket of 10 drug products
CTD=average cost to dispense	Operating expenses allocated to the prescription department divided by the annual prescription volume
Predictors:	
PMAJTP=percent private third-party prescriptions	Ratio of the number of private third-party prescriptions constituting more than 5% of volume divided by the number of prescriptions dispensed in January 1995
PXIX=percent Medical Assistance prescriptions	Ratio of the number of public third-party prescriptions (if more than 5% of volume) divided by the number of prescriptions dispensed in January 1995
RXAD$=prescription department allocated advertising expense	Advertising expense allocated to the prescription department
LOCALPY=number of competitors in the local market	Number of pharmacies within a 5-mile radius
PPGM=private pay gross margin	Difference between private-pay price and actual acquisition cost weighted across the market basket of 10 drug products

Pharmacies that have a greater proportion of their prescription market covered by third-party service benefits are expected to have less price flexibility, higher costs, possibly expanded volume, and consequently, lower prescription department profits. In Wisconsin, Medicaid historically has reimbursed at a higher level than most other third-party payers, so the proportion of prescriptions covered by Medicaid was separated from the proportion covered by other payers. The proportion of prescriptions covered by Medicaid was calculated as the number prescriptions on the one month reconciliation report divided by the number of prescriptions dispensed in January 1995 (PXIX). The proportion of prescriptions covered by major payers was computed similarly but it only reflects the largest contracts (greater than 5% of volume)(PMAJTP). The restriction to the largest payers was made to simplify data collection as well as these were the plans thought to have the greatest impact on a pharmacy's profitability. The overall proportion of prescriptions covered by insurance, including smaller programs, was recorded in Part I of the survey (PALLTP). According to the model, as the proportion of third-party prescriptions for Medicaid and private contracts increases, prescription department profit should decline.

Independent Variables: Structural Factors

The cost structure was modeled by calculating the cost-of-dispensing per prescription (CTD) with expenses allocated as described in the derivation of the prescription department profit index. Cost-of-dispensing was expected to show a

negative relationship to profit and was included as a control variable in the model to reflect economies of scale. Since labor is the largest operating expense in a prescription department, a second variable was created to test its usefulness as an alternative to CTD. Salary or wages for personnel who perform prescription-related activities was allocated according to the proportion of time spent in those activities. In the cases where owners did not explicitly pay themselves, they were asked during the site visit to impute a wage for themselves. Some reported that any pharmacy profit became their wage while others went with a market rate. This imputing of wages only occurred in three cases. Wages were summed across all employees to get a total prescription labor expense (RXLABOR) then divided by the number of prescriptions dispensed in the 12-month fiscal period to remove the effect of volume (LABPRX).

Purchasing power reflects the ability of the pharmacy to obtain discounts, often based on high volume buying. Pharmacies that belong to buying groups or are members of large chains are able to generate purchasing power and negotiate lower cost of goods sold (Kreling and Kirk, 1986). For fixed reimbursement, these firms should be able to generate greater margins than pharmacies without access to discounts. To measure buying power, actual acquisition costs for a market basket of ten drug products were recorded. The products included were randomly selected from the Top 200 Drugs of 1994 (Table 7) (Simonsen, 1995). Actual acquisition cost was defined as the cost given on the purchase invoice without accounting for discounts for early payment or manufacturer rebates. Differences in package size were accounted for by computing the

cost per tablet or capsule or unit cost. Unit costs for each product were multiplied by the prescription quantity (Table 7) used in the private pay pricing variable to calculate the acquisition cost for the market basket (AVGAAC). As with labor/operating expense, product costs reflect economies of scale and were controlled for in the final model.

Table 7. Market Basket and Quantities for Pricing

Drug Product	Strength	Quantity
Amoxicillin Capsules	250 mg	30
Biaxin Tablets	500 mg	20
Ceclor Capsules	250 mg	30
Cipro Tablets	500 mg	20
Hytrin Tablets	5 mg	30
Ibuprofen Tablets	600 mg	90
Micronase Tablets	2.5 mg	60
Norvasc Tablets	5 mg	30
Relafen Tablets	500 mg	60
Vasotec Tablets	5 mg	30

Exogenous structural factors affecting pharmacies' performance are the number and size of competitors. The level of competition was defined as the number of pharmacies within a 5-mile radius as listed in the Hayes' Druggist Directory (Hayes, 1995). For larger metropolitan areas, this dramatically reduces the number of pharmacies considered as competitors.

Independent Variables: Conduct

Advertising is a reflection of a firm's attempt to gain and maintain customers. The prisoner's dilemma from game theory applied to advertising implies that pharmacies will advertise more heavily than is optimal suggesting a negative effect on profits. Owners/managers were asked to indicate the proportion of advertising expense that focused specifically on the prescription. The advertising to sales ratio has been argued to be the best predictor in this type of industry (Porter, 1974), but this ratio for prescription related advertising was such a small proportion that the actual dollar amount spent on prescription advertising was used (RXAD$).

Price-setting behavior in a prescription market is reflected in private pay prices. Private pay prices were attained for the ten drugs in the market basket for a typical one month supply of each product (Table 7). Pricing behavior was measured as the private pay gross margin, which is the difference between the private pay price and the acquisition cost for each product. To reflect differences in product utilization between pharmacies, each drug in the market basket was weighted relative to the other drugs for that pharmacy. The number of packages purchased, based upon review of the invoices, of each of the ten drugs was summed, and the proportion attributed to each individual product was divided by the overall sum to get the weight. These weights were applied to each product's private pay gross margin and the sum of the weighted gross margins became the private pay gross margin variable (PPGM).

Statistical Analysis

After reviewing the frequencies and descriptive statistics for each variable, multiple regression was used to test the models reflecting the research hypotheses. The first model included only the control variables: acquisition costs (AVGAAC), cost-of-dispensing (CTD), and prescription volume (JANTOT) (equation 1). Prescription department labor expense (LABPRX) was tested as an alternative to CTD in the control model also (equation 1a).

(1) $PPRFIN = B_0 + B_1JANTOT + B_2AVGAAC + B_3CTD$

(1a) $PPRFIN = B_0 + B_1JANTOT + B_2AVGAAC + B_3LABPRX$

where,

PPRFIN = index of prescription department profits,

JANTOT = number of prescriptions dispensed in January 1995,

RXAD$ = prescription department advertising expense,

AVGAAC = weighted acquisition cost for market basket,

CTD (LABPRX) = cost-of-dispensing (labor expense) per prescription,

B_0 = intercept,

B_1-B_3 = respective slopes for control variables.

The impact of participation in Medicaid and private third-party programs was tested by adding the proportion of Medicaid (PXIX) and larger third party contracts (PMAJTP) to the model with the control variables (equation 2). Directional hypotheses were stated for each variable to evaluate research hypotheses 1 and 2 (Table 8).

(2) $PPRFIN = B_0 + B_1 \ldots B_3(\text{Control Variables}) + B_4 PMAJTP + B_5 PXIX$

where B_4 to B_5 = respective slopes for third-party variables.

To test the impact of competition on prescription department profits, the number of competitors within 5 miles (LOCALPY), private pay gross margins (PPGM), and prescription advertising expense (RXAD$) were entered into the model (equation 3). Directional hypotheses were stated for each variable with the exception of the advertising ratio (Table 8). This model tested research hypotheses 3, 4, and 5.

(3) $PPRFIN = B_0 + B_1 \ldots B_3(\text{Control}) + B_4 LOCALPY + B_5 PPGM + B_6 RXAD\$$

where B_4 to B_6 = respective slopes for competition variables.

Table 8. Hypotheses and Critical p-values

Model/Hypothesis	Alternative Hypothesis	Critical p-value
Third-Party Model		
H1: $B_{PXIX} = 0$	H1A: $B_{PXIX} < 0$	1-tailed, 0.0125
H2: $B_{PMAJTP} = 0$	H2A: $B_{PMAJTP} < 0$	1-tailed, 0.0125
Competition Model		
H3: $B_{PPGM} = 0$	H3A: $B_{PPGM} > 0$	1-tailed, 0.0125
H4: $B_{RXADVS} = 0$	H4A: $B_{RXADVS} < 0$	1-tailed, 0.0125
H5: $B_{LOCALPY} = 0$	H5A: $B_{LOCALPY} < 0$	1-tailed, 0.0125
Interactions		
H6: $B_{I1 \ldots I6} = 0$	H6A: $B_{I1 \ldots I6} \neq 0$	2-tailed, 0.05

The sixth hypothesis called for a test of the interaction between participation in third-party programs and competition and the resulting effect on prescription department profits. All possible interaction terms were included (equation not shown). The coefficients on the interaction terms were tested for significance with nondirectional hypotheses.

Four of the six hypotheses were directional to provide greater power. Statistical hypotheses and their respective critical p-values are listed in Table 8. Critical p-values were determined by identifying whether variables were conceptually independent or dependent. If independent, the full alpha level was given to that test. Otherwise, the alpha level was divided between dependent tests. Prior knowledge of the theoretical relationships between variables was used to determine independence. The proportions of prescriptions that are paid for by private and public programs were the only predictors known to be independent of prescription volume. The Pearson product moment correlation between percent third-party and prescription volume was only 0.1271 in a cost-of-dispensing study (Schafermeyer, Schondelmeyer, and Thomas, 1990). Participation in prescription insurance programs can increase dispensing costs (Health Information Designs, 1979; (Schafermeyer, Schondelmeyer, and Thomas, 1990), so a significant relationship between operating costs and third-party participation in either type of program was possible. Participation in Medicaid may lead to higher product costs than participation in private insurance (Mott, 1995; Kotzan and Carroll, 1991). In addition, participation in private programs was expected to be inversely related to participation in

Medical Assistance. A priori, therefore, there were four possible conceptually dependent variables in the third-party participation model. Using this information, the coefficients for the third-party variable were tested at alpha (0.05) divided by four (0.0125).

For the competition model, since private-pay prices are frequently based on a mark-up on cost (Stone, 1985), a positive relationship was anticipated between PPGM and AVGAAC. Operating costs were expected to be positively related to advertising costs. Given these two hypothesized relationships, the alpha level for the competition variables was divided by four to capture the dependencies between four of the variables (0.05/4=0.0125).

No direction hypotheses were stated for the interaction model. This portion of the model was more exploratory. Given the small sample size, the power for testing so many variables would undoubtedly be limited. An alpha of 0.05 was used for the overall model.

The foregoing discussion is an a priori method for accounting for multicollinearity. By making each test more conservative based upon conceptual knowledge of the variables, one can control the type I error rate (Seaman, Levin, and Serlin, 1991). Planned comparisons were tested using the Holm sequential procedure also to control familywise alpha (Holm, 1979; Seaman, Levin, and Serlin, 1991). The Holm procedure tests the largest t-statistic at alpha divided by the number of comparisons remaining to be tested. In the competition model, there were two tests among conceptually dependent regression coefficients for PMAJTP and PXIX. The largest t-statistic was tested at alpha allocated to each variable divided by the number of

comparisons (C). For this first model where C=2 and alpha=0.0125, the first t-statistic was tested at 0.00625. Following a significant result, the next largest t-statistic was tested at alpha/(C-1). The procedure was continued until a nonsignificant t-statistic was found. The same procedure was used for the third-party competition model, except C=3. Regression coefficients were computed using ordinary least squares (OLS) regression, and analyses were conducted using SPSS/PC+ (SPSS, 1992).

CHAPTER IV

RESULTS

The results of the study are reported in this chapter. Characteristics of the sample plus an analysis of nonresponse bias are reported in the first section. The second section contains descriptive statistics from Part I of the survey. Descriptive statistics including correlations for the variables from Part II of the survey are reported in the third section as a preliminary investigation of the hypothesized relationships. Finally, the fourth section displays the regression results for the models testing competition, third party participation, and their combined effect on prescription department profits. The discussion of the results, limitations, and concluding remarks follow in Chapter V.

Sample

In the attempt to enroll 40 pharmacies, fifty-nine initial contacts were made concerning 68 pharmacies. Four contacts were made directly with corporate offices of a national or regional chain drug store resulting in participation by one large chain contributing data on two pharmacies. One corporate office refused while the other two never responded to the request to participate. Four other corporate offices were contacted indirectly after an initial contact with the local manager. Three of the four pharmacies solicited this way participated including one chain that provided data for a pharmacy initially enrolled yet refused for a second replacement pharmacy. Fifty percent of the

corporate contacts contributed data on five out of eighteen (27.8%) of the sites selected. All corporate sites that failed to participate were replaced by randomly drawn small chain or independent pharmacies. Of the remaining 50 independent or local chain contacts, thirty-four participated (68%). Overall participation by number of outlets was 39 of 68 pharmacies for a rate of 57%.

The 2x2 stratification matrix was well-balanced in the final sample with three cells having ten participants and one cell with nine (Table 9). The cell with nine participants was the high competition and high insurance group. The nine participants came from 20 contacts (45% response rate). Particpation rates for the other three cells were 10 of 15 (66.7%) for the high insurance-low competition cell, 10 of 17 (58.8%) for the low insurance-high competition cell, and 10 of 16 (62.5%) for the low insurance-low competition cell. Areas with more pharmacies (e.g. higher competition) were less likely to participate reflecting their greater corporate pharmacy penetration.

Characteristics of participants and nonparticipants are displayed in Table 10. The population and number of pharmacies in the local community and the distribution of pharmacies by SMSA were obtained from secondary sources (Wiederholt, 1996; Hayes, 1994a; Hayes, 1994b). Average daily volume was recorded for 15 of the 31 nonrespondents, while the proportion of prescriptions covered by third-party programs and Medicaid was obtained for 16. Estimates of average daily volume, Medical Assistance and private insurance participation were not available from all nonparticipants. One pharmacy was unable to provide an estimate of average daily volume. Ten of the

stores not providing nonresponse data were members of three large chains, two of which failed to respond to any prompts. Another pharmacy was a member of a chain who refused to participate at all. Two independent pharmacies refused to provide any information at all, and the other remaining pharmacy was dropped from the sampling frame because the owner had surgery.

Table 9. Participation by Stratification Variables

		Competition	
		Low	High
Insurance	Low	Contacts Corporate[a]=4 Noncorporate[b]=12 Participants Corporate=0 Noncorporate=10	Contacts Corporate=7 Noncorporate=10 Participants Corporate=3 Noncorporate=7
	High	Contacts Corporate=2 Noncorporate=13 Participants Corporate=1 Noncorporate=9	Contacts Corporate=5 Noncorporate=15 Participants Corporate=1 Noncorporate=8

a. Corporate defined as ten or more pharmacies under a regional or national ownership including franchise operations.
b. Noncorporate included fewer than ten pharmacies under local ownership.

Neither participants nor nonparticipants differed significantly from the statewide distribution of pharmacies by SMSA in a chi-sqaure analysis although nonparticipants

tended to be in larger urban areas than participants. Consistent with their location, they reported higher overall third-party participation, lower Medicaid participation, and a greater number of competitors, yet none of these differences were statistically significant using chi-square analysis. Average daily prescription volume was lower for the participants, but this likely reflects the failure to get prescription volume information from the large chains. Again, the difference was not statistically significant with chi-square analysis.

Table 10. Comparison of Nonparticipants and Participants

	Participants (n=39)	Nonparticipants (n=29)
Average Population in local community	113,274	130,790
Distribution by SMSA:		
Rural (<2,500)	7 (17.9%)	3 (6.5%)
Small Non-Urbanized (2,500-25,000)	17 (43.6%)	12 (38.7%)
Large Non-Urbanized (25,000-50,000)	1 (2.6%)	3 (9.7%)
Urbanized (>50,000)	13 (35.9%)	13 (45.2%)
Average Number of Pharmacies in Local Community	23.4	26.6
Average Daily RX Volume	143	105 (n=15)
Percentage All Third-Party	60.6	64.8 (n=16)
Percentage Medicaid	18.4	14.8 (n=16)

The primary reasons given for not participating were lack of time or too much work (n=6) and refusal to release the information (n=5). Other reasons (number of pharmacies) were recent death of owner (1), poor record keeping (2), new computer system (1), personal reasons (1), corporate refusal (13), owner had emergency surgery (1), and simply did not want to participate (2). It had been expected that more pharmacies would refuse due to the sensitive nature of the information collected, but the timeliness and importance of the topic seemed to outweigh this concern for most pharmacies.

Participants compared well to Lilly Digest pharmacies, a secondary source of financial information on a convenience sample of independent pharmacies (Table 11). Sales have increased since 1993 as considered. The inclusion of chain pharmacies brought the ratio of prescription to total sales down for the participating pharmacies compared to the Lilly Digest figures. New to total prescription volume was 47.7% for participants and 52.2% for Lilly Digest pharmacies. Participants filled a higher percentage of prescriptions for private third party programs reflecting a higher rate of coverage of prescriptions as a benefit in insurance plans in Wisconsin versus the nation.

Given these descriptions of the sample and comparisons to non-participants and secondary data, it was clear that the sample was not representative of pharmacies in the state. The sample consisted of a greater proportion of non-corporate pharmacies which skewed the statistics on the basic operating characteristcs of the participants. These differences are important in the interpretation of the results.

Table 11. Comparison of Participants to Lilly Digest Data

	1995 Participants (n=39)	1994 Lilly Digest Data (n=925)
Total Sales	$1,613,640	$1,269,071
Prescription Sales	1,139,663	994,445
Prescription Sales Ratio	0.706	0.784
Cost of Goods Sold Percent*	71.3	71.9
Gross Margin Percent*	28.7	28.1
Total Expenses Percent*	23.2	25.1
Total RX Volume	40,891	38,660
New to Total RX Ratio	0.477	0.517
Percent Medicaid	18.4	21.0
Percent Other Third-Party	42.2	35.0

* Percents calculated as the percent of total sales.

Descriptive Statistics from Part I

Part I of the survey instrument was used to collect information on general operating characteristics of each pharmacy. Included in the survey were questions soliciting the owners'/managers' impressions about and reactions to the local market. Their responses provided a qualitative impression of the impact of competition and third party programs.

Although owners/managers thought the market area was moderately to highly competitive (92.3% of respondents), they believed they maintained about or more than a proportionate share of their market (76.9% of respondents) (Tables 12). Mail order pharmacy took away the greatest share of their business, and prescriber dispensing,

samples, and managed care pharmacy were least likely to take away customers (Table 13). Rankings for the other listed sources of competition were fairly evenly distributed.

One possible response to price competition is to match or beat competitors' prices. Only 23.1% of the sample indicated that they advertise or promote price matching. For those that did, they actually did match or beat competitors' prices on 16.6% of their prescription volume. This proportion varied widely, though, with a range from 1% to 70%.

Table 12. Perceived Competitiveness in Local Trading Area

Market Share: Proportion of Local Trading Area[a]:	Number	Percent
Less than a proportionate share	9	23.1
About a proportionate share	19	48.7
More than a proportionate share	11	28.2

Price Aggressivenes of Local Trading Area[b]:		
Not Competitive	0	0
Minimally Competitive	3	7.7
Moderately Competitive	17	43.6
Highly Competitive	19	48.7
Extremely Competitive	0	0

a. Question 1 in Part I of survey instrument.
b. Question 2 in Part I of survey instrument.

Volume buying and participation in buying groups can give pharmacies a

competitive advantage through purchasing efficiencies. Seventy-two percent of the independent pharmacies belonged to buying groups which operated through their primary wholesaler. On average, pharmacies purchased 77.5% of their prescription inventory through the primary wholesaler who often served as the buying group. Purchasing directly from manufacturers can be an option for obtaining better terms on product costs, although this strategy is becoming less common. Still, thirty-eight of the pharmacies averaged 10.9% of their purchases direct from the manufacturer. Secondary wholesalers were used for 9.3% of the purchases for 32 pharmacies. The remaining 2.3% of purchases were from chain warehouses and other sources.

Table 13. Sources of Competition: Taken Away Most Customers*

	Fewest		Rank			Most	Mean
Competitor	1	2	3	4	5	6	Rank
Prescriber Samples	5	10	6	7	5	4	3.2
Non-local Community Pharmacies	9	7	11	6	2	3	2.8
Mail Order Pharmacies	0	2	9	4	9	15	4.7
Local Community Pharmacies	7	4	6	8	6	7	3.6
Prescriber Dispensing	18	11	3	1	1	2	1.9
Managed Care Pharmacy	12	6	2	6	8	3	3.0

* Question 3 in Part I of survey instrument.

The output maximization model for the retail pharmacy market suggested that

Table 14. Reasons for Declining Participation in Third-Party Programs: Distribution of Importance Rankings*

	Least		Rank			Most	Mean
Problem Category	1	2	3	4	5	6	Rank
Reimbursement	1	0	0	0	1	21	5.7
Pharmacy Administration	5	8	6	0	0	0	2.0
Claims Payment	2	2	4	4	6	1	3.6
Third-Party Administration	4	6	5	3	1	0	2.5
Contractual	3	1	0	6	8	1	3.9
Operational	10	1	1	7	1	0	2.4

* Question 8c in Part I of survey instrument.

The output maximization model for the retail pharmacy market suggested that declining participation in third party programs that reimburse below average cost would improve a pharmacy's profitability. While pharmacies typically have participated in most contracts presented to them, the recent cuts in reimbursement and other program adminstration problems should provide cause for pharmacies to decline participation. Twenty-three of the pharmacies (59%) indicated that they had declined participation in third party contracts in the past year. Fourteen pharmacies discontinued participation in an average of 2.1 ongoing contracts (range 1-5). Twenty-one of the pharmacies had declined new contracts either presented by customers or received through the mail. The average number of contracts they declined was 5.6 though two declined twelve and two others declined 20 plans. As expected, the most important reason for declining

participation was reimbursement problems (Table 14). In fact, twenty-one of the 23 pharmacies indicated this was the primary reason.

Descriptive Statistics, Correlations, and Preliminary Results

Means, standard deviations, and ranges for all continuous variables included in the survey are shown in Table 15. (Frequency histograms and bivariate plots of each of the predictors and the dependent variable are included in Appendix C.) These statistics provide a sense of what types of businesses the participants operated and display the averages of the variables included in the models in the next section. Correlations between selected variables are discussed in terms of the expectations derived from the model, and regression analyses follow in the next section.

Respondents on average had been in operation for 19 years (range 1-107), though some had been restructured or changed owners during that period. The ratio of new to total prescriptions was 50% for January and 47% for the year. Prescription department cost-of-goods sold averaged just under $840,000 a year (range $204,585-2,605,000) to give a prescription department gross margin of 26% (range 15-46%). Labor expense allocated to the prescription department totalled nearly $145,000 per year (range $26,456-491,693). This may be an underestimate since three sole proprietorships did not expense out their labor costs in their income statements, and their imputed salaries were often lower than the average salary of pharmacists in the state.

Table 15. Descriptive Statistics for Continuous Variables

Variable	Mean (SD)	Range	N
Prescription Volume:			
January New	1,719.2 (973.9)	551-5,259	38
January Refill	1,786.5 (1,052.11)	334-5,231	38
January Total	3,432.6 (2003.0)	555-10,490	39
Fiscal Year (1995) New	19,520.5 (10,661.1)	6,770-57,234	38
Fiscal Year (1995) Refill	22,065.0 (13,807)	4,974-69,952	38
Fiscal Year (1995) Total	40,891.0 (24,129.0)	11,744-127,186	39
Years of Operation	18.9 (17.9)	1-107	39
RX Sales	$1,139,662.5 (730,507.8)	$290,157-3,438,000	39
RX Cost of Goods Sold	$839,414.7 (548,448.4)	$204,585-2,605,000	39
Computer Expense	$8,047.2 (10,027.8)	$600-48,900	31
Proportion RX-Related	97.4% (7.4)	70-100	31
Delivery Expense	$4,937.1 (6,226.4)	$50-26,523	30
Proportion RX-Related	98.1 (3.8)	90-100	30
Advertising Expense	$11,695.0 (14,177.4)	$481-65,048	36
Proportion RX-Related	65.4 (36.0)	5-100	36
RX Labor Expense	$144,890.6 (114,914.2)	$26,456-491,693	39
Cost-to-Dispense	$6.50 (3.02)	$3.43-16.54	39
RX Profit Index	1.00 (2.80)	-5.89-9.24	39

To calculate net profit for the prescription department, expenses had to be allocated to prescription related activity. Owners/managers were asked to provide estimates for computer, delivery, and advertising expenses and the proportion of each

related to prescription activity. These were considered to be the primary direct expenses, but it was not clear how many pharmacies would be able to break out estimates for these categories. Thirty-one of the pharmacies (79%) were able to provide an estimate for computer expense. In some cases, these estimates were derived during the site visit based upon totalling hardware and software update costs and monthly or annual fees. Thirty pharmacies (77%) provided delivery expense, but this partially reflects whether the pharmacy provided delivery service. Thirty-six of the pharmacies (92%) were able to give advertising expense figures, but these were more frequently recorded as separate items on the income statements than the other direct expenses. Averages for the expense amount, the proportion related to prescription activity, and the resulting allocated costs are shown in Table 15. If pharmacies did not report advertising or computer or delivery expense separately, these costs were assumed to be in the remaining expenses category. After the prescription department labor expense and the allocated direct expenses were removed from the total operating expenses, the remaining expenses were allocated using the sales ratio. Combining the allocated direct expenses, prescription department labor expense, and allocating the remaining expenses gave an average cost-of-dispensing of $6.50 (range $3.43-16.54). The resulting profitability index for the prescription department had a mean (by definition) of 1.00 and a standard deviation of 2.49. The average pharmacy had a net profit, though some reported significant net losses during the year. The pharmacy reporting the greatest net loss had undergone major restructuring during the year and seemed to operating quite well during the site visit. No adjustments

were made to account for this pharmacy's financial figures.

From the purchase invoices, pharmacies purchased an average of $70,014 from the different sources in one month (Table 16). Multiplied by 12 to get an annual figure yielded $840,168 which is slightly higher than the prescription department COGS obtained from the income statements. This is surprising since purchase invoices were not separated by departments, e.g. over-the-counter items from prescription items, during data collection and should have overstated prescription purchases by a larger amount.

Table 16. Descriptive Statistics for Purchasing Characteristics

Source	Mean (SD)	Range	N
Wholesaler Purchases	$61,854.2 (36,944.9)	$11,173-159,307	39
Direct Purchases	$6,381.9 (8,727.8)	$0-38,000	37
Warehouse Purchases	$6,280.2 (18,579.6)	$0-88,196	30
Total Purchases	$70,014.2 (43,108.0)	$13,006-195,199	38

The private pay prices for the market basket of ten products showed a high degree of variability (Table 17). Two of the products included in the basket proved to be problemmatic. The patents for Micronase and Ceclor had expired prior to January 1995, so most pharmacies no longer used the brand name products. They were retained in the basket, however, and given a weight of zero if none was purchased in the one month period. One pharmacy did not give a private pay price for Micronase and two did not give prices for Ceclor since they no longer used the products.

Acquisition costs were taken from purchase invoices. Unit costs were computed, multiplied by the relevant quantity, and then summed across the products comprising the market basket to give the average acquisition cost variable (AVGAAC). Due to differences between pharmacies in utilization, only six products were used across the entire sample (Amoxicillin, Biaxin, Cipro, Ibuprofen, Relafen, and Vasotec).

Table 17. Descriptive Statistics for Market Basket

	Private Pay Prices		Product Weights	
Product/Variable	Mean (SD)	Range	Mean (SD)	Range
Amoxicillin 250 mg (30)	9.97 (2.55)	6.45-16.28	0.09 (0.09)	0.01-0.53
Biaxin 500 mg (20)	68.32 (7.48)	56.95-95.87	0.14 (0.09)	0.03-0.41
Ceclor 250 mg (30)	69.43 (4.69)	60.60-77.13	0.03 (0.04)	0.00-0.15
Cipro 500 mg (20)	70.48 (7.17)	58.95-97.21	0.06 (0.04)	0.00-0.18
Hytrin 5 mg (30)	42.02 (4.84)	35.95-59.14	0.09 (0.06)	0.00-0.23
Ibuprofen 600 mg (90)	14.15 (4.41)	7.69-25.89	0.08 (0.04)	0.01-0.17
Micronase 2.5 mg (60)	25.46 (4.61)	14.35-36.30	0.03 (0.03)	0.00-0.11
Norvasc 5 mg (30)	40.36 (4.75)	34.30-54.90	0.07 (0.05)	0.00-0.21
Relafen 500 mg (60)	66.65 (7.76)	53.95-95.67	0.22 (0.09)	0.03-0.43
Vasotec 5 mg (30)	29.60 (4.32)	13.70-42.75	0.18 (0.10)	0.03-0.34
Average Acquisition Cost (AVGAAC)	175.72 (2.41)	171.34-183.01		
Private Pay Gross Margin (PPGM)	13.79 (5.63)	4.86-40.09		

Acquisition costs were also subtracted from private pay prices, and the margin weighted and combined to compute the average private pay gross margin (PPGM). The three products with the highest average weights were Biaxin (0.14), Vasotec (0.18), and

Relafen (0.22). There was considerable variability in the weights showing how prescribing practices differ across the sample sites.

In order to validate some of the measures, correlations were done between managers'/owners' perceptions and the actual measures taken during the site visit or from secondary data. The competition model used the number of pharmacies within a five mile radius (LOCALPY) as a variable. As LOCALPY increased, owners/managers reported capturing less than a proportionate share of their local trading area ($r=-0.1585$) but less aggressive price competition ($r=-0.1221$), though neither relationship was statistically significant. The correlation between the proportion of prescription purchases from the primary and secondary wholesalers as estimated by the owners/managers was statistically correlated to the proportion calculated from the purchase invoices ($r=0.8753$, $p<0.001$). The estimate for direct purchases, however, was not significant ($r=0.3088$).

The proportion of prescriptions covered by Medicaid as estimated by owners/managers was significantly correlated to the proportion taken from one month of reconciliation reports ($r=0.8757$, $p<0.001$). While the instructions indicated they could estimate the former figure, most participants used computer generated reports to complete that question. The printout figures were often from a full year, though, so the proportion of Medicaid prescriptions remains fairly consistent across time. The correlation between the proportion of non-Medicaid third party programs reported by managers and the sum of the major payers (PMAJTP) as taken from the reconciliation reports during the site visits, on the other hand, was not significant ($r=0.4023$). This reflects the variation in

contracts from year to year in private plans as mangers/owners considered their participation at the time of the site visit rather than participation in January 1995.

The correlation matrix for the variables included in the regression models are shown in Table 18. Bivariate plots of each of the predictors with the dependent variable are displayed in Appendix C. A few of the correlations were statistically significant. There was a significant negative relationship between the proportion of prescriptions covered by Medicaid versus private third-party contracts ($r=-0.451$, $p=0.004$) consistent with previous research. Prescription department advertising expense was significantly related to cost-of-dispensing ($r=0.524$, $p=0.001$) reflecting, in part, how CTD was calculated. The correlation between PPGM and LOCALPY was positive and moderate in magnitude ($r=0.3926$, $p=0.013$). This suggests that in areas with more pharmacies, private pay gross margins are actually higher. The effect is not direct, however, since PPGM consists of a locally defined market basket and may reflect more expensive products being used in urban areas. Pharmacies with higher operating costs (CTD) also had significantly higher private pay gross margins ($r=0.337$, $p=0.036$). The conservative approach of the hypothesis testing should have reduced bias introduced by these significant correlations.

Table 18. Correlation Matrix for Independent and Dependent Variables

	January RX Volume	Average AAC	Private-Pay Gross Margin	RX Advertising Expense	Number of Competitors	Proportion Major Private TP	Proportion Medicaid	Profit Index
Cost-To-Dispense	-0.058	-0.250	0.337**	0.524*	-0.094	0.267	0.082	-0.369
January RX Volume	-	-0.016	0.204	0.178	0.080	0.008	-0.205	0.073
Average AAC	-	-	-0.266	-0.065	-0.054	0. 113	-0.139	0.086
Private-Pay Gross Margin	-	-	-	0.037	0.393**	0.127	0.259	0.007
RX Advertising Expense	-	-	-	-	-0.162	0.075	0.161	0.002
Number of Competitors	-	-	-	-	-	-0.164	0.272	0.007
Proportion Major Private TP	-	-	-	-	-	-	-0.451*	-0.280
Medicaid	-	-	-	-	-	-	-	0.283

* $p<0.01$, **$p<0.05$

None of the remaining correlations were statistically significant, although a couple yielded interesting findings. Costs-of-dispensing were higher for pharmacies with a greater proportion of major private third-party payers, but the association with Medicaid proportion was substantially weaker. The second finding was that areas with more local pharmacies had higher proportions of Medicaid prescriptions and lower proportions of major private third-party prescriptions.

Regression Models

In this section, the results of the hypothesis testing are provided. According to the model, the goal was to test the impact of third-party participation and competition after controlling for the effect of economies of scale. The first step in building the full model was to regress the control variables on the dependent variable (PPRFIN). The impact of third-party programs was then studied by adding the third-party variables. The impact of competition was analyzed by adding those variables to the control variable model. Finally, the third-party and competition variables were entered and tested as the full model. The results follow in this order. Residual analyses for all models tested are included in Appendix D.

Economies of scale are assumed to be represented by purchasing efficiencies (AVGAAC), prescription volume (JANTOT), and operating costs (CTD). Prescription volume for January was used to coincide with the period during which the totals for each third-party contract was collected. The cost-of-dispensing was used as the operating cost

variable, though labor expense per prescription was also tested to see if it served as a reasonable proxy. The results of this regression are shown in Table 19. No research hypotheses were tested in this model. Cost-of-dispensing was a significant predictor of profitability, though, with the expected negative relationship. As product costs decline profits increase, also as expected, but this relationship was not statistically significant. Prescription volume was not a significant variable either and had an extremely small effect on the profit index. The overall F statistic for the model was not significant.

Table 19. Regression Results: Control Variables (Using CTD)

Variable	Coefficient	SE	T-Statistic	p-value
Average Acquisition Cost	-0.0054	0.1884	-0.029	0.9772
Cost-To-Dispense	-0.3397	0.1504	-2.259	0.0302*
RX Volume	7.257×10^{-5}	2.196×10^{-5}	0.330	0.7430
Constant	3.9109	33.4009	0.117	0.9075
F (df=3,35)			1.877	0.1515
R-squared	0.1386			
Adjusted R-squared	0.0648			

When prescription department labor expense (LABPRX) was substituted for CTD, the results were nearly identical. Labor expense was the only significant variable in the model with a coefficient close to the coefficient for CTD. The regression results for the same models but using labor expense are included in Appendix E. Cost-of-dispensing is reported for the remaining models in this section.

The first model for hypothesis testing was the impact of third-party programs. The proportion of prescriptions covered by Medicaid (PXIX) and the proportion covered by the major third-party payers (PMAJTP) were entered. Each was predicted to have a negative effect, therefore each was tested as a directional hypothesis. Neither t-statistic for PXIX nor PMAJTP was significant (Table 20). The coefficient on PMAJTP had the expected negative direction, but the PXIX did not. This probably reflects the fact that Medicaid was one of the better payers in the state at the time of the study. Cost-of-dispensing was also significant in this model and the coefficients on the other two control variables maintained the expected direction. Based upon this model neither research hypothesis 1 or 2 could be rejected.

Table 20. Regression Results: Impact of Third-Party Programs

Variable	Coefficient	SE	T-Statistic	p-value
Average Acquisition Cost	0.0540	0.1845	0.293	0.7715
Cost-To-Dispense	-0.3389	0.1551	-2.185	0.0361*
RX Volume	1.677×10^{-4}	2.162×10^{-4}	0.776	0.4435
Medicaid	8.5461	4.6701	1.830	0.0763
Major Third Parties	-1.0176	4.5149	-0.225	0.8231
Constant	-7.8065	32.6556	-0.239	0.8125
F (df=5,33)			2.2169	0.0760
R-squared	0.2514			
Change in R-squared from control model	0.1128		2.4873	0.0986

The second set of hypotheses focused on the impact of competition on profitability.

The competition variables added to the control variables were the dollars of advertising allocated to the prescription department (RXADV$), the number of pharmacies within a 5-mile radius (LOCALPY), and the private pay gross margin on the market basket of drug products (PPGM). None of the competition variables were significant, though the coefficients for PPGM and LOCALPY had the expected signs (Table 21). The coefficient on the prescription department advertising variable was positive suggesting that prescription department advertising may improve profitability. Of the control variables, CTD was significant. Research hypotheses 3 through 5 could not be rejected.

Table 21. Regression Results: Impact of Competition

Variable	Coefficient	SE	T- statistic	p-value
Average Acquisition Cost	0.0143	0.1899	0.075	0.9403
Cost-To-Dispense	-0.5899	0.1949	-3.026	0.0049*
RX Volume	-9.396×10^{-5}	2.338×10^{-4}	-0.402	0.6905
Private Pay Gross Margin	0.1320	0.0974	1.355	0.1849
Number of Competitors	-0.0143	0.0252	-0.567	0.5745
RX Dept Advertising	1.251×10^{-4}	7.526×10^{-4}	1.663	0.1062
Constant	0.3989	33.8076	0.012	0.9907
F (df=6,32)			1.6190	0.1741
R-squared	0.2329			
Change in R-squared from control model	0.0943		1.3108	0.2879

The final model tested was the full model including both the competition and third party variables entered as blocks (Table 22). Due to the small sample size, no interaction terms were included in the model. Once again, control variables were entered first. The third party variables were entered next as a block (PXIX and PMAJTP). Competition variables (PPGM, RXADV$, and LOCALPY) followed as the second block. None of the blocks were significant. Cost-of-dispensing was still the only significant predictor. This model was over-specified due to the small sample size. Based on this model, the sixth reserach hypothesis could not be rejected.

Each possible interaction between the third party and competition variables was tested individually with the full model. None of the interactions were statistically significant (results not shown). The two that provided for the greatest change in R-squared were major third party proportion by private pay gross margin and major third party proportion by prescription advertising. The former supports the notion that the proportion of a pharmacy's market that is covered by insurance affects the price on cash customers, or the private pay gross margin weighting may be picking up a difference product mix for areas with varying levels of third party participation. The second interaction may reflect differences in advertising strategies or other characteristics of the market.

This concludes presentation of the results of the analyses completed for this project. The discussion of the results relative to the hypotheses stated at the conclusion of Chapter II follows in the next chapter. The limitations of the analyses are also discussed.

Table 22. Regression Results: Full Model

Variable	Coefficient	SE	T-statistic	p-value
Average Acquisition Cost	0.0649	0.1905	0.341	0.7358
Cost-To-Dispense	-0.5083	0.1974	-2.575	0.0152*
RX Volume	4.113×10^{-5}	2.494×10^{-4}	0.165	0.8701
Major Third Parties	-2.3284	4.7491	-0.490	0.6275
Medicaid	6.8005	5.3806	1.264	0.2160
Private Pay Gross Margin	0.1028	0.1030	0.998	0.3261
Number of Competitors	-0.0255	0.0255	-0.999	0.3256
RX Dept Advertising	8.419×10^{-5}	7.802×10^{-4}	1.079	0.2891
Constant	-9.1174	33.7910	-0.270	0.7891
F (df=8,30)			1.6834	0.1436
R-squared	0.3098			
Change in R-squared:				
1) Control Block	0.1927		2.7925	0.0574
2) Third-Party Block	0.0770		1.6724	0.2048
3) Competition Block	0.0584		0.8459	0.4797

CHAPTER V

DISCUSSION

This chapter serves to link what was learned through the empirical data collection and analysis with the theoretical and practical significance of the observations. First, given the quantitative results presented in the preceding chapter, there is a discussion of their interpretation in relation to the model posited in Chapter II. Undeniably, these interpretations are contingent upon the methods employed in collecting the data and measuring the variables of interest, so a discussion of the project limitations is included. The relevance of this study to the current state of knowledge as well as its use in future research from an industrial organizations perspective is discussed.

Discussion of Quantitative Findings

The first conclusions are drawn from the descriptive statistics on the owners'/managers' perceptions and opinions of the markets they serve. As expected, the participants rated their markets as moderately to highly competitive. While a substantial portion of their prices are fixed by third-party contracts, all felt that they retained some pricing flexibility in the cash market. The variability in the cash prices reported for the market basket of ten drugs supports their retention of some market power vis a vis price setting. This factor is important in terms of responding to their local trading area. Most of the respondents felt they retained about or more than a proportionate share of the local

trading area. This does impose a limitation to the generalizations of the results as it suggests that the participants may have been more successful pharmacies.

Despite this success in their own neighborhoods, the greatest threat to their client base was mail order pharmacy. This project did not address the penetration of mail order pharmacy in the Wisconsin markets, but it certainly was deep enough to concern these pharmacists. This is a critical area for future research. A third threat to their market share is prescriber samples. Interestingly, this author knows of no studies evaluating the economic impact of samples. For some markets, samples are a crucial source of medications, such as low income or free medical clinics. Yet, these populations may face a higher risk for drug related problems by receiving medications without attendant pharmacist counseling or monitoring.

Another question not addressed in the literature is the practice of matching or undercutting a competitor's prescription price although this practice has existed for a number of years. Only nine of the thirty-nine participants indicated that they actively pursue this competitive strategy. This strategy probably is limited by the size of the cash market and the level of competition in the market. Follow-up studies could address the effectiveness of price matching for pharmacies and the impact on market prices.

One of the toughest issues for pharmacies has been the growth in third-party prescription insurance. Owners/managers reported almost sixty-one percent of their volume is covered by such plans. Most of the respondents indicated they have declined participation in new or ongoing contracts due to reimbursement problems in the previous year. As the

prisoner's dilemma demonstrated, pharmacies may improve their viability regardless of how their competitors react with this strategy. The proposed model based upon output maximization predicts that third-party contracts with average reimbursement below the average costs associated with that contract should be denied. Presumably, since reimbursement problems were the primary reason for declining contracts, pharmacists are making some type of comparison. Most likely, from anecdotal reports, they are comparing the offered acquisition cost formula to their actual acquisition costs and not performing cost-of-dispensing or operating cost estimates. Acquisition costs are only part of the costs associated with providing prescriptions, however. In the third-party analyses provided to the individual pharmacies, most of the third-party contracts generated losses to the pharmacies when operating costs were taken into account. One of the results of this study is that prescription department labor can substitute for cost-of-dispensing estimates. Pharmacists could more easily calculate their prescription department labor costs rather than try to allocate all of the prescription department expenses as in a cost-of-dispensing analysis enabling them to evaluate future third-party contracts terms more readily and completely.

Although these conclusions are based solely upon descriptive statistics, they provide information about how owners/managers perceive the environment in which they make decisions. This is an important basis for understanding how they behave. Future research may be able to link these perceptions to market analysis.

From the statistical approach, six research hypotheses were tested using multiple regression. Each is discussed below with some interpretation and explanation of the results.

Although an argument was presented for output maximization as opposed to profit maximization as the underlying assumption, the difference was not tested empirically. Rather, the statistical models evaluated how third-party participation and competition affect prescription department profits after controlling for factors thought to affect profits.

A few comments about how well the control variables performed are in order. Previous research suggested that economies of scale existed in retail pharmacy (Lohrisch, 1974; Reeder, 1987; Cady, 1975; Lamphere-Thorpe, et al., 1994). Volume has also been shown to be a significant predictor of margins (Norwood and Gagnon, 1975), and volume typically has been used to model economies of scale. The economies, though, are drawn from minimizing input and operating costs. Based on this knowledge, three variables were introduced into the model to capture these effects prior to testing the hypotheses of interest. Economies of scale arise from two types of costs in retail pharmacy: operating expenses and product acquisition costs. Operating costs were captured using the cost-of-dispensing per prescription variable (CTD), and product acquisition costs were measured with the average acquisition cost variable (AVGAAC). Only operating costs added significantly to the various models in this study. In fact, operating costs were significant in all models tested consistent with the principle that cost-minimization is equivalent to profit maximization. The coefficient on the drug product acquisitions costs variable had the expected negative sign but was not significant. It appeared that using invoice costs limited the range of differences in acquisition costs (e.g. ignoring manufacturer rebates). This may also reflect that most pharmacies attain similar terms in buying through their wholesalers.

Volume did not add substantially to the regression models. The slight negative correlation between volume and dispensing costs (r=-0.058) does not support the literature describing economies of scale. In fact, when labor expense per prescription was substituted for dispensing costs, the correlation was slightly positive (r=0.026). The relationship between volume and labor expense may be a jump function rather than the hypothesized linear relationship. For instance, as volume increases, a pharmacy must hire an additional pharmacist which is a significant expense. That additional input can dispense a wide range of prescription volume, but as the pharmacy passes the threshold point, economies of scale temporarily become diseconomies until volume expands sufficiently to cover the added fixed cost. Maximizing one's prescription volume may not necessarily be the optimal focal point for pharmacy providers depending upon how much additional volume can be obtained. This supports the need to move away from simply accepting third-party contracts without understanding how they will affect one's cost structure.

Another problem with the volume measure is that it reflects only one type of output, prescriptions. There are other services or outputs from prescription departments such as patient counseling and therapeutic monitoring, interactions with other health care providers, and public health triage and education. These are labor intensive services that are not captured in the traditional volume measurement.

Hypotheses 1 and 2 differentiated third-party payers into two classes: public (Medical Assistance) and major private (greater than 5% of volume). Participation in either category was expected to have a negative effect on prescription profits. Neither hypothesis was

supported statistically. In fact, the proportion of prescriptions covered by Medical Assistance had a positive effect on profit. This reflects that Medical Assistance was one of the better payers in Wisconsin at the time. Overall, though, the addition of the third-party variables did account for a significant proportion of variance. Operationalizing third-party participation as the proportion of prescriptions covered by two classes of payers may be the limiting factor for understanding the actual relationships. For instance, the major third-party payer category undoubtedly includes a wide variety of reimbursement schedules and contractual requirements for the participating pharmacies. This group may be too heterogeneous to lump together into one category. A second consideration is that the product mix by payer type was not controlled for. Previous research has shown significant differences in the products prescribed for different payer groups (Mott, 1995; Kotzan and Carroll, 1991).

Another problem with this particular statistical analysis was the significant negative correlation between the two third-party predictors. As the proportion of prescriptions covered by Medical Assistance increased, the proportion covered by the major private payers declined ($r=-0.451$, $p=0.004$), a relationship consistent with previous research in Wisconsin retail pharmacy markets (Kreling, 1987). This relationship is not surprising as one would expect poorer areas to have more Medical Assistance and less private health insurance and vice versa for wealthier neighborhoods. Still, it seems unusual that pharmacies with higher Medical Assistance, even given better payment levels, and more likely to be in poorer areas would be more profitable. A partial explanation may be the positive, but not significant,

correlation between private pay gross margins and Medical Assistance proportions. The higher private pay gross margins may come from indemnity insurance beneficiaries, e.g. for elderly with Medigap coverage, who are reimbursed for some proportion of their out-of-pocket expense. Using price discrimination or differential pricing, these customers can be charged higher prices than out-of-pocket patients because they are eventually reimbursed for their outlays. Since indemnity contracts theoretically do not have any price setting ability, they are forced to reimburse based upon the charge submitted by the patient. An anecdote from data collection illustrates this point. One pharmacist reported overall third-party proportion of approximately 57%, the bulk of which was Medical Assistance. Of the remaining 43%, only 4% was actually cash customers while the other 39% had indemnity coverage. The latter group comprises a substantial portion of the cash market which may in fact be even less price sensitive than the "true" cash customers.

Three competition measures were tested in this study: private pay gross margins, advertising expense, and number of competitors. Prescription department profits were expected to increase as private pay gross margins increased but decline as the number of competitors and advertising expense increased. None of the three competition variables were significant, and the overall regression model did not account for a significant proportion of variance. The signs on the coefficients for number of competitors and private pay gross margins were in the expected directions, though.

The failure of the private pay gross margin variable may be due to the weights applied to the products in the market basket. Each product was weighted to reflect its

relative importance for each pharmacy. While this serves as a method of accounting for differences in morbidity and prescribing patterns between sites, it masks the absolute value of the margins. Private pay gross margin was significantly and positively correlated with the cost-of-dispensing and number of competitors variables. Not surprisingly, pharmacies with higher costs charge higher prices. The positive association between private pay gross margins and competition, however, is counterintuitive. There may be an interaction between payer type or market mix of payers and private pay gross margins. As noted before, areas with higher Medical Assistance participation had higher private pay gross margins, and these are the pharmacies located in areas of higher concentration. Part of the explanation may lie with the indemnity insured market as described above.

An additional explanation for the failure of the number of competitors within a five mile radius to have significant explanatory power may be that it does not account for the actual local trading area. When discussing their definition of the local trading area with owners/managers, most indicated an area of several blocks rather than miles. In fact, in urban areas, the relevant area probably falls within a one mile or less range. The number of pharmacies in that area would be considerably smaller. The other problem with the measure is that is does not account for mail order penetration. This overlays an additional form of competition that cannot be measured with ease geographically. Perhaps future work can draw from other types of markets that have had significant mail order penetration.

Though game theory suggested that pharmacy providers would advertise more than they should, this study actually found a positive but not significant correlation to

profitability. Prescription advertising was significantly correlated to cost-of-dispensing reflecting how cost-of-dispensing was computed. Prescription advertising as a proportion of sales was tested but it was an extremely small value and poorly distributed in this sample. Consistent with previous research, prescription advertising does not seem to be a significant factor (Boyer, 1974).

Hypothesis six was tested by adding the competition and third party variables to the control model in blocks. This model theoretically reflects the simultaneous consideration of the factors thought to determine profitability in the retail pharmacy market. Given that the overall model was not significant, refinements to the theory are in order. Interaction tests would enable one to determine the dynamic relationships between these market factors. Unfortunately, testing all possible interactions between the third-party variables and competition measures was not appropriate due to inadequate sample size.. After testing individual interactions, though, two indicated a potential for future work: 1) major third party payers by private pay gross margin and 2) major third party payer by prescription advertising. Both indicate competitive responses to changes in price flexibility. Exploring interactions would necessitate larger samples in the future.

Limitations

The interpretation of the results requires an acknowledgment of several limitations. The issues discussed in this section are the sample size, the cross-sectional design, measurement problems, and generalizability.

A major limitation to this study was the sample size. A balance was sought in this project to achieve a feasible design that required highly sensitive and detailed data while maintaining statistical power. The sample size calculation based upon the expected effect size greatly overestimated the standard deviation of prescription profit as a percent of sales and consequently the effect size. Since most of the variables carried the predicted sign, a larger sample would improve the power and should provide more support for the theory. Two observations may enable future researchers to enlarge the sample size while maintaining sufficient detail. One is that a full cost-of-dispensing analysis is not necessary: simply computing prescription department labor is adequate. The second note is that prescription department cost of goods sold can be estimated from a one month compilation of purchase invoices with a fair degree of accuracy. Other modifications to the data collection instrument undoubtedly would enable one to perform a direct survey without the site visit allowing for a larger sample size to be collected. The downside would be a lower response rate.

A second limitation stems from the cross-sectional design. Appreciation of the impact of competition and third-party participation requires a dynamic model since the market is evolving continually. Even during the course of data collection, most pharmacists indicated that their third-party contracts had changed dramatically both in reimbursement schedules as well as number of enrollees from the preceding year. Competitive strategies also play out over time as pharmacies react to their competitors actions (Porter, 1980). The cross-sectional data provide a baseline. All of the participants expressed a willingness to participate in a panel that will allow for longitudinal studies tracking the market.

Several measurement issues were noted in the discussion of the results, such as the demarcation of the local trading area. Additionally, some of the expenses had to be allocated to the prescription department by the owners/managers, and these allocations were often based upon hunches or guesses. There was also variation across pharmacies in their accounting and financial reporting methods. These factors introduce measurement biases and reduce reliability.

The unit of output for the cost-of-dispensing analysis and for productivity was prescription volume or number of prescriptions. This measure is drug product related and fails to account for the services provided in addition to the physical good. As the profession expands its service provision, better output measures must be developed. In their individualized reports, pharmacists were encouraged to separate services in their accounting reports so they can follow that portion of their business. One possible solution is to turn to a client visit approach akin to the physician services' measure of patient visits, but there still would be a need to account for the elements of each visit.

Of course, generalizability is a concern since the sample was limited to Wisconsin markets. Generalizing to the entire state and nation is not possible. Excluding pharmacies located in the northern third of the state removed many isolated, rural pharmacies that may have had different characteristics. Other counties were excluded because of characteristics that made them fall outside the assumptions for stratifying the sample. Compared to the nation, Wisconsin has a high penetration of HMOs. Prescription insurance service benefits are a required element in State employees' contracts which may make the level of third-party

participation higher than other states. Based on the comparison to Lilly Digest data, overall third-party participation was higher. Pharmacies that participated in this project were similar in other aspects to those providing data for the Lilly Digest, though the inclusion of a few corporate owned outlets lowered the prescription to total sales ratio for the sample.

Due to their unwillingness to cooperate, large corporate owned pharmacies are under represented. Several attempts were made to encourage their participation including a guarantee that the type of ownership would not be included in the model nor would the actual discounts earned from manufacturer rebates on acquisition costs be solicited. Since this was an analysis of local markets, major differences between types of ownership were not expected.

Policy Implications and Future Research

A variety of policy topics can be evaluated within the structure-conduct-performance paradigm. There are a number of antitrust issues relevant to retail pharmacy such as discriminatory and predatory pricing, classes of trade, and market definitions. The Federal Trade Commission increasingly is interested in the proposed mergers between large corporate retail pharmacy operations. In fact, they opted not to allow the proposed merger between Revco and Rite-Aid, two of the largest chain pharmacy operations. The Justice Department made a significant decision by defining the relevant market as only the corporate owned pharmacies in the region. This definition ignores the contribution of independent pharmacies to the market, but it also places a more restrictive definition upon the corporate

owners. By ignoring the independent operations, the market appears to be more concentrated, especially by chains with a large number of outlets in the area. This decision probably will prevent some other mergers from occurring.

Not only is there horizontal integration occurring in retail pharmacy, but significant changes are happening through vertical integration. Classifying the alliances and organizations that are emerging is increasingly difficult. Pharmaceutical manufacturers have moved into the arena of retail distribution by purchasing mail order operations. Various types of managed care operations have also moved into retail distribution by buying out existing pharmacies or building in-house pharmacies. The exclusive contracts that arise from these organizations can create significant barriers for pharmacies who cannot opt in.

For pharmacy providers, the key to maximizing profits remains cost-minimization, consistent with economic theory. This principle was supported by the operating cost variable, though, and not by the drug product acquisition cost variable. Pharmacies have sought purchasing efficiencies from volume buying either through their own chain warehouses or cooperative buying groups, but exogenous factors like local morbidity and prescribing patterns seem to constrain the economies that can be achieved with these efforts. As for minimizing operating costs, labor expense minimization faces a minimum constraint of ensuring accurate and adequate provision of pharmacy services. If too much labor is cut, the quality and accuracy of care provided will suffer.

While pharmacies have focused on cost-minimizing, this model suggests that other market place factors are also important. Prescription volume as an output measurement only

propagates the drug product based mentality and limits pharmacy's ability to expand its other services. Many of the pharmacies who participated in this study qualitatively recognize that diversifying their product line, e.g. offering services besides prescriptions, is necessary to remain in the market. This may lead to some interesting alliances between providers in remote areas.

Going beyond the traditional study of economic efficiency, the proposed model can be used to address concerns of equity or access. Mergers, acquisitions, and changes in ownership at the manufacturer level generate far more interest than these changes at the retail level, but following the retail market is important for ensuring that the general population retains access to prescription medications. For instance, are resources being allocated to areas of need and does the population have access to health care services? As corporations increase concentration in the retail pharmacy industry, they may disproportionately locate in urban or suburban areas. There is increasing interest in the distribution of pharmacies in rural areas as they are the most accessible health care providers (Sorofman, Knapp, and Paavola, 1996).

Access is also a concern within markets with pharmacies available. Third-party payers must balance cost containment with adequate reimbursement to attract and maintain providers. Increasingly, pharmacists are declining contracts showing that the balance has tipped too far in one direction. The payers who simply base their reimbursement decisions upon acquisition costs of the drug product fail to recognize that owners/managers face multiple factors in their daily operations besides procuring the product. This limited focus

can create severe access problems, including access to the array of pharmacy services available, for their beneficiaries. For the indigent population covered by Medicaid, the ramifications reach even further as the pharmacy may serve as the primary or only health care access point. It has already been documented that inadequate reimbursement leads to decreased physician participation in Medicaid and hospital closures (Mitchell, 1991; Hernandez and Kaluzny, 1983).

CHAPTER VI

CONCLUSION

The model introduced in this study can be used to examine a broad range of issues. These can be issues of relevance to practitioners as well as academics or policy makers. The purpose of this project was to evaluate how the increase in third-party participation and competition affects the economic well-being or viability of retail pharmacies. Ultimately, pharmacies that struggle financially may be forced to close and access problems may arise for local communities. With due regard to those who are attempting to change our focus from a product based profession to a more service orientation, this project was done under the belief that without the sites, the service cannot be provided. So, this project was concerned with the environmental factors that are believed to threaten their continued operation.

Previous research on retail pharmacy has been limited to studying individual or isolated elements of the market. Cost-of-dispensing studies gave the field a great deal of information on the cost structure of the industry, but this rarely was tied to conduct or performance in the market. Studies of cost-shifting and pricing differentials did not account for the relative influence of competition in the market. By way of introducing a general theoretical framework from industrial organizations, this researcher sought to demonstrate that a multi variate approach is necessary for analyzing the retail pharmacy market. The structure-conduct-performance framework serves as a rich source of ideas for future research.

At the outset of this research idea, there was great concern that soliciting such sensitive and detailed information from pharmacy owners/managers would be nearly impossible. A number of factors contributed to the successful completion of this project. First, the issue was important to the participants. They wanted someone to examine this problem. Second, respondent burden was limited through the site visit approach to data collection. The pharmacists were quite receptive to allowing the researcher access to their records on-site especially since they did not have to complete the worksheets themselves. Participants also were interested in receiving an individualized report that contained a cost-of-dispensing and third-party analysis plus provided them with comparison data from the entire sample. Finally, members of the research institution maintain an interactive and positive relationship with pharmacy providers around the state. Keeping these ideas in mind will assist future research in the retail pharmacy industry.

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APPENDIX A

COUNTIES INCLUDED IN SAMPLING FRAME

Table A1. Distribution of Counties in Wisconsin According to the Stratification Matrix*

	LEVEL OF INSURANCE	
COMPETITION	LOW (1-3 Plans)	HIGH (4-8 Plans)
LOW (<20 pharmacies)	51	7
HIGH (>=20 pharmacies)	5	7

*Two counties were excluded because they do not have any pharmacies.

Exclusion criteria:

1) Known characteristics of the county that were inconsistent with the sampling rationale. Most of these were situations where the assumption of the distribution of State HMO plans was likely to underestimate the actual proportion of prescriptions covered by insurance. Often these areas had large private companies present. For instance, Rock county was excluded from the Low insurance/High competition cell because of large private employer (General Motors)that offered prescription insurance benefits. Counties excluded under this criteria were:

Sheboygan	Marathon
Wood	Portage
Winnebago	Jefferson
Dodge	Rock

2) Counties that fell into the low competition cells but were actually located near major metropolitan or highly competitive counties. Counties excluded under this criteria were:

Calumet	Pierce
St. Croix	Walworth
Ozaukee	Washington
Kewaunee	

3) Most of the counties in the northern third of the State were excluded due to the extreme sparseness of the population. The area covered multiple national and state parks and forests. A single State insurance plan may cover a significant proportion of the population leading to higher than expected levels of third party concentration. A line was drawn across the state from below Marinette County to the bottom side of Polk Counties. Counties above this line were excluded:

Polk	Barron	Rusk
Price	Oneida	Forest
Marinette	Vilas	Iron
Ashland	Bayfield	Sawyer
Washburn	Douglas	Burnett.

4) Dane county was excluded to avoid "overburdening" these pharmacy providers with requests from the University of Wisconsin School of Pharmacy.

5) Two counties (Florence and Menominee) did not have any independent or chain pharmacies and were excluded.

The remaining counties were included in the sampling frame. The pharmacies for the counties in these cells were pooled and a random sample of 10 drawn from each pool. Pharmacies that declined participation were replaced with a different randomly selected pharmacy from the same cell. Counties included are displayed according to the stratification matrix. The number in parentheses after the county name indicates the number of pharmacies located in that county if more than one.

Table A2. Counties Included in the Sampling Frame

COMPETITION	LEVEL OF INSURANCE: LOW (1-3 Plans)		LEVEL OF INSURANCE: HIGH (4-8 Plans)
LOW (<20 pharmacies)	Adams	Buffalo	Chippewa
	Clark	Crawford	Columbia
	Door	Dunn	Richland
	Fond du Lac	Grant	Sauk
	Green	Green Lake	Trempealeau
	Iowa	Jackson	
	Juneau	Lafayette	
	Langlade	Lincoln	
	Manitowoc	Marquette	
	Monroe	Oconto	
	Pepin	Shawano	
	Taylor	Vernon	
	Waupaca	Waushara	
HIGH (>= 20 pharmacies)	LaCrosse		Kenosha
	Outagamie		Milwaukee
	Brown		Racine
			Waukesha
			Eau Claire

APPENDIX B

LETTERS AND DATA COLLECTION INSTRUMENT

Introductory Letter with List of Data Elements

Date

Owner/Manager Name
Pharmacy Name
Address
City, WI Zip Code

Dear Owner/Manager:

Tighter third-party reimbursement policies and heightened competition from traditional and newer sources, such as mail order and managed care pharmacies, present challenges to the financial viability of community pharmacies. While these forces have existed for some time, there are no rigorous studies examining their combined economic impact on community pharmacies.

We need your help. Your pharmacy is one of a small number of Wisconsin pharmacies that has been selected for inclusion in a study targeting these concerns. As a preview, we have enclosed a list of the kinds of data we will be collecting. One of our priorities is to develop a data collection process that should make it easier for you to participate in the study. Along with a brief survey, we will visit your pharmacy to tabulate data from internal documents and reduce the amount of work you must do in answering our questions.

We recognize that the data we are asking for are sensitve. All responses will be kept CONFIDENTIAL, and only aggregate results will be reported. Although we will collect data from specific records, we will not take any internal documentation with us. Unfortunately, we will not be able to compensate your effort directly. However, we will send you summary results and highlights of our findings for your pharmacy (e.g. cost-of-dispensing, a third-party financial profile, etc.) to see how it compares to the entire sample.

We will be contacting you within the next two weeks to explain more about the project and hopefully gain your willingness to participate. If you any questions prior to our call, please contact us at the numbers listed below.

Sincerely,

David H. Kreling, Ph.D., R.Ph.
Associate Professor
Pharmacy Administration
Phone: (608) 262-3454

Theresa I. Shireman, M.S., R.Ph.
Doctoral Candidate
Pharmacy Administration
Phone: (608) 263-3959

STUDY ON THE IMPACT OF COMPETITION AND REIMBURSEMENT ON PHARMACY FINANCIAL VIABILITY

Data Categories

We will be asking for information on:

prescription volume
perceptions of competition in your market
third-party participation
third-party reimbursement
third-party contract decisons
financial information (e.g. income statement elements)
personnel expense for the prescription department
acquisition costs and prices for 10 drugs.

Survey Cover Letter

Date

Owner/Manager Name
Pharmacy Name
Address
City, WI Zip Code

Dear Owner/Manager:

Thank you for aggreeing to participate in our study of the impact of third-party reimbursement and competition on the financial viability of community pharmacies. Enclosed in the survey booklet we would like for you to complete.

This is the first phase of data collection. Rather than mailing the survey back to us, we will set up an appointment with you at your pharmacy to collect the survey. Our visit will serve as a second phase of data collection during which we will tabulate data from other documents. At the time of the site visit, we will go over the contents of the survey with you and answer or clarify any questions.

We recognize that the data we are asking for are sensitve. All responses will be kept CONFIDENTIAL, and only aggregate results will be reported.

We will be contacting you within the next two weeks to establish a convenient time to visit your pharmacy and complete the data collection procedure. If you have any questions before then or as you complete the form, please contact us at the numbers listed below.

Thank you again for your willingness to participate. We look forward to the visit at your pharmacy.

Sincerely,

David H. Kreling, Ph.D., R.Ph.
Associate Professor
Pharmacy Administration
Phone: (608) 262-3454

Theresa I. Shireman, M.S., R.Ph.
Doctoral Candidate
Pharmacy Administration
Phone: (608) 263-3959

Survey Instrument

ID#___

Performance in the Retail Pharmacy Industry:
Impact of Third-Party Programs and Competition

Data Collection Instrument

Owner/Manager _____

Pharmacy name _____

Address _____

City/Town _____

PART I

INSTRUCTIONS FOR PART I:

This portion of the booklet primarily contains questions related to your perceptions about competition and third-party programs with additional items related to estimates of the magnitude of their impact. Please complete PART I prior to the site visit.

Although we would like for you to complete each question as accurately as possible, you may provide estimates whenever you are unable to fill in a known value. In some cases, we are especially interested in *your opinion*, so an estimate based upon your impression is expected.

If you do not understand a question or need clarification, either call us or mark the question and we can discuss it during the site visit. When you have completed the survey, keep it and we will pick it up during the site visit.

Please indicate the dates of the most recently completed fiscal year from which you are reporting information. Answer all questions with this time frame as the basis unless otherwise specified.

From _____,19___ to _____, 19___.

OPERATIONAL CHARACTERISTICS

This section requests information on various operating characteristics. Please consider the most recently completed fiscal year as the time basis for your responses.

The following two questions (1 & 2) refer to your ***local trading area***. By ***local trading area***, we mean the geographic region where most of your customers are from.

1. In your **OPINION**, what proportion of the ambulatory prescription business does your pharmacy get relative to competiting pharmacies in your *local trading area*? (For example, if there are three pharmacies in your *local trading area*, do you fill less than a third, about a third of the prescriptions, or more than a third?)

   _____ Less than a proportionate share.

   _____ About a proportionate share.

   _____ More than a proportionate share.

2. In your **OPINION**, from the following list how would you characterize the **aggressiveness of price competition** for private pay (cash) ambulatory prescriptions within your *local trading area*?

   _____ Non-competitive: can set all cash prices as wish.

   _____ Minimally competitive: can set most cash prices as wish.

   _____ Moderately competitive: can set about half the cash prices as wish.

   _____ Highly competitive: can set only a few cash prices as wish.

   _____ Extremely competitive: cannot set any cash prices as wish.

3. Please rank the following sources of prescriptions according to their impact on taking customers away from your pharmacy. (1=has taken away the fewest customers to 6=has taken away the most customers).

_____ Prescriber samples

_____ Other non-local community pharmacies

_____ Mail order pharmacies

_____ Other local community pharmacies

_____ Prescriber dispensing

_____ Managed care pharmacies

4. Do you promote or advertise that you will meet or beat competitor's prescription prices?

_____YES (if yes, then answer question 4a)

_____NO (if no, go onto question 5)

4A. For what proportion of the prescriptions that you dispense in a month do you **ESTIMATE** that you meet or beat a competitior's price?

_____%

5. What percentage of your prescription inventory acquisitions do you **ESTIMATE** come from each of the following sources?

____% Buying group/Purchasing cooperative

____% Primary wholesaler

____% Secondary wholesaler

____% Direct from manufacturers

____% Chain warehouse

____% Other, specify _____

100% TOTAL

THIRD PARTY PROGRAMS

This section requests information on third party programs. We are interested in the proportion of your prescription volume that comes from different payers and whether problems with programs have led you to discontinue third party contracts.

6. Estimate the total proportion of your prescription volume that is reimbursed by all third party programs combined (including Medical Assistance).

_____%

7. *For this question, we are only interested in third party programs that account for **more than 5% of your prescription volume**.* From the list of third party prescription programs below, indicate which third party programs you maintain contracts with by supplying an **ESTIMATE** of the **proportion of total prescriptions** you filled in the last fiscal year that were reimbursed by that program. Attach additional pages as needed for contracts not listed.

Program Name	**Estimated Proportion of Total Annual Prescriptions Under This Contract***
State Medical Assistance	_____ %
PCS (any plan)	_____ %
DPS (any plan)	_____ %
PAID Prescriptions (any plan)	_____ %
Aetna	_____ %
DeanCare	_____ %
U-Care	_____ %
Physicians' Plus	_____ %
Bravell (any plan)	_____ %
Valuerx (any plan)	_____ %
Blue Cross/Blue Shield	_____ %
HMO of Wisconsin	_____ %
Other: (specify)	_____ %
Other: (specify)	_____ %

8. Have you declined participation in any third party prescription program contracts presented by customers in the past fiscal year?

_____YES (if yes, answer questions 8A, B, & C)

_____NO (if no, go on to question 9)

8A. About how many third party program contracts did you stop participating in during the past fiscal year? _____

8B. About how many third party program contracts did you consider for customers and decide not to participate in during the past fiscal year?

_____

8C. For the third party programs that you have declined in the past fiscal year, whether old or new, we are interested in the reasons that made you decide not to participate. In the list below, rank order the six reasons for not participating according to their relative importance. (1=least important reason to 6=most important reason for not participating). Examples of each problem are given in the table on the next page.

PRIMARY REASON FOR DECLINING	IMPORTANCE RANKING
Reimbursement problems	_____
Administrative problems at the pharmacy	_____
Claims payment problems	_____
Administrative problems at the third party processor	_____
Contractual problems	_____
Operational problems at the pharmacy	_____

Examples for Item 8C

Reimbursement problems:
inadequate dispensing fees, inadequate ingredient cost reimbursement, low profit on third party prescriptions, insufficient price increases, inadequate reimbursement for services

Administrative problems at the pharmacy:
excessive paperwork and complicated forms, too many restrictions and unknown covered items/information, too many different dispensing fees, uninsured individuals possess third party identification cards

Claims payment problems:
slow claims payment, too many rejected/denied claims, too many rules/regulations for claims reimbursement, difficult to receive payment for rejected claims, reductions in dollar amount submitted for reimbursement

Administrative problems at the third party programs:
poorly trained personnel make transcription errors, poor payment processing, pharmacies not informed when individual or company-wide coverage is terminated, no electronic claims processor

Contractual problems:
lack of collective bargaining power, third party programs have a "take-it-or-leave-it" attitude, contracts allow for excessive quantities to be dispensed, "lower of" provisions in the contracts are weighted in the third party programs' favor

Operational problems at the pharmacy:
too few third party program participants, inventory control is difficult due to excessive quantities per prescription, restricted cash flow

COMMENTS/SUGGESTIONS

On this page, we would like for you to record your impressions about the questions we have asked and any concerns you may have. We would also like for you to give us input as to other issues you would like to have studied.

9. Comments/concerns:

_____

_____

_____

_____

_____

10. Suggestions for future research:

_____

_____

_____

_____

THANK YOU FOR COMPLETING THIS SECTION!!!

Please read the instructions for PART II before proceding.

PART II

INSTRUCTIONS FOR PART II:

The remaining pages of this booklet include questions about financial aspects of your pharmacy. You may either complete portions or all of this section prior to the site visit or simply provide the relevant materials for us to complete it during the site visit. Please read through this section, however, to help you understand what information we are seeking.

To complete this section, we will need your most recently completed income statement, your prescription volume for the most recently completed fiscal year and for the month of January 1995, and current cash prices for 10 prescription drugs.

In addition, please have ready the following documentation for the on-site visit. We will gather information directly from these documents:

1) Purchase invoices for January 1995 from all sources (e.g. direct, buying groups, wholesalers),

2) Third-party reconciliation forms from processors who constitute 5% or more of your prescription volume (e.g. see list on page 4) for prescriptions filled in January 1995,

3) A list of personnel who work in the prescription department, their wages, and an estimate of the proportion of time they spend doing prescription-related activities.

We will not take any of your internal documents with us.

FINANCIAL INFORMATION

In this section, we are collecting information on financial aspects of your pharmacy. Again, we wish to emphasize that all information will be kept **CONFIDENTIAL**. Use figures taken from your most recently completed financial statements. If you wish to provide us with income statements and or tax returns during the site visit, we can collect the necessary data confidentially. If the actual amount is not known, please provide the best ESTIMATE you can.

11. Number of prescriptions dispensed in your pharmacy in January 1995, and during the past fiscal year:

	January 1995	Fiscal Year
New Rxs	_____	_____
Refill RXs	_____	_____
Total RXs	_____	_____

12. How long has this pharmacy been in operation under the present ownership or management at this location?

_____ YEARS

13. GENERAL INFORMATION:

	Total Store (Including Prescription Department)	**Prescription Department ONLY**
Net sales	$_____	$_____
Cost of goods sold	$_____	$_____
Total operating expenses	$_____	
Total wages and salaries (for all employees)	$_____	

14. SPECIAL EXPENSE DETAILS:

Please provide the total dollar amount and an **ESTIMATE** of the proportion of the expense that was incurred through prescription-related activity.

Category	Total Expense	Estimated Proportion Related to the Prescription Department
Computer	$_____	_____%
Delivery	$_____	_____%
Advertising	$_____	_____%

15. PERSONNEL COSTS

We are collecting itemized employment expense in this section. For employees that worked any amount of time in the prescription department, please indicate their total salaries or wages for the year. Also, please ESTIMATE the number of employees and the proportion of time they spend in areas other than the prescription department. Attach additional pages if necessary.

Employee	Number of FTEs	Wage/Salary
Manager(s)/Owner(s)	_____	_____
Pharmacists	_____	_____
Interns	_____	_____
Technician(s)/Clerk(s)	_____	_____

Employee	Number	Percent of Time Outside RX Dept.
Manager(s)/Owner(s)	_____	_____
Pharmacists	_____	_____
Interns	_____	_____
Technician(s)/Clerk(s)	_____	_____

16. PRESCRIPTION PRICING

For each product listed below, please give the current cash customer price for the given quantity.

DRUG NAME/STRENGTH/(QTY)	PRIVATE PAY PRICE (CURRENT)
Hytrin 5 mg (30)	$_____.___
Biaxin 500 mg (20)	$_____.___
Cipro 500 mg (20)	$_____.___
Ibuprofen 600 mg (90)	$_____.___
Relafen 500 mg (60)	$_____.___
Amoxicillin 250 mg (30)	$_____.___
Norvasc 5 mg (30)	$_____.___
Micronase 2.5 mg (60)	$_____.___
Vasotec 5 mg (30)	$_____.___
Ceclor 250 mg (30)	$_____.___

17. Acquisition Costs and Purchase Quantities for Market Basket

WE WILL COMPLETE THIS SECTION DURING THE SITE VISIT. We have included this table to demonstrate the information we will be collecting from the purchase invoices. Please provide all purchase invoices for the month of January 1995.

NAME/STRENGTH	MANUFACTURER	PKG SIZE	AAC/PKG	# PKG
Amoxicillin 250 mg				
Biaxin 500 mg	Abbott			
Cipro 500 mg	Miles Pharm			
Ceclor 250 mg	Lilly			
Hytrin 5 mg	Abbott			
Ibuprofen 600 mg				
Micronase 2.5 mg	Upjohn			
Norvasc 5 mg	Pfizer			
Relafen 500 mg	SmithKline Beecham			
Vasotec 5 mg	MSD			

18. Major Third-Party Payer Reconciliation Reports

WE WILL COMPLETE THIS SECTION DURING THE SITE VISIT. We have included this table to demonstrate the information we will be collecting from the third party reconciliation reports. Please provide the reconciliation forms for any payers that constitute more than 5% of your prescription volume (see page 4) for the month of January 1995.

PAYER	DATES OF SERVICE	# CLAIMS	BILLED INGRED COST	ADJUST TO INGRED COST	DISP FEES	COPAYS OR COINS.	AMT REIMB BY PAYER

This concludes PART II and the entire survey.

THANK YOU FOR YOUR PARTICIPATION!!!

Please record any additional comments that you have:

_____

_____

_____

_____

_____

_____

We will send you summary results once the data have been analyzed.

APPENDIX C

FREQUENCY DISTRIBUTIONS AND BIVARIATE PLOTS OF VARIABLES

Figure C1. Frequency Histogram for Prescription Volume (JANTOT)

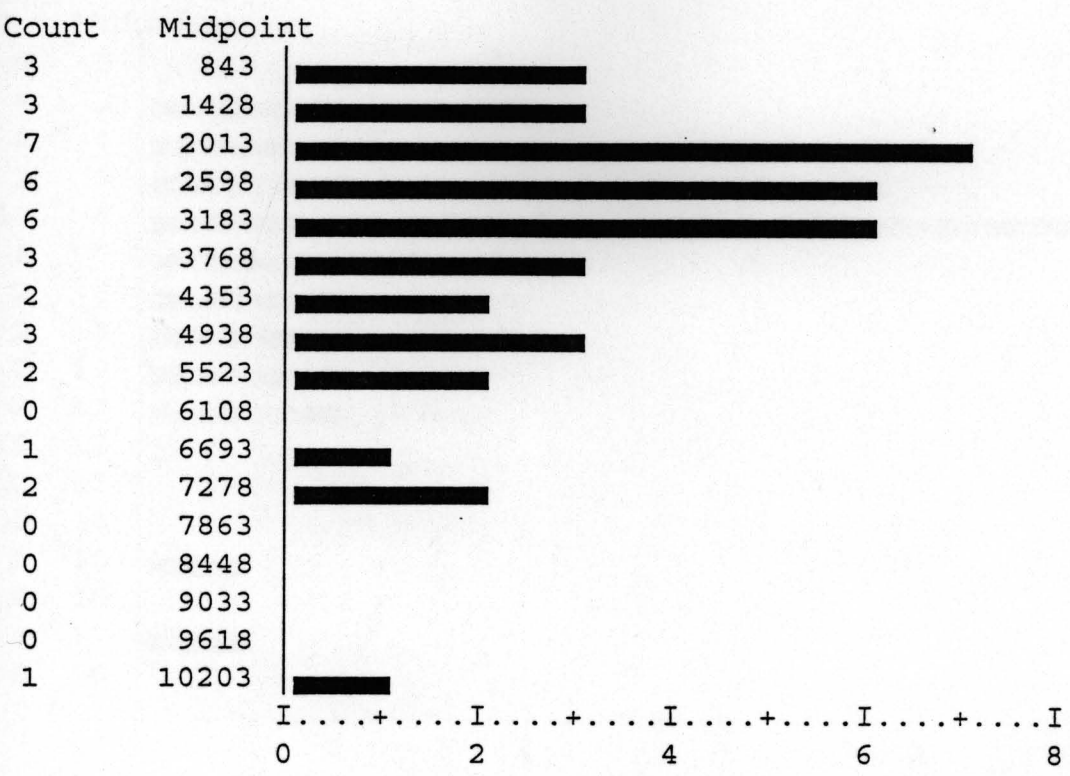


Figure C2. Frequency Histogram for Cost-of-Dispensing (CTD)

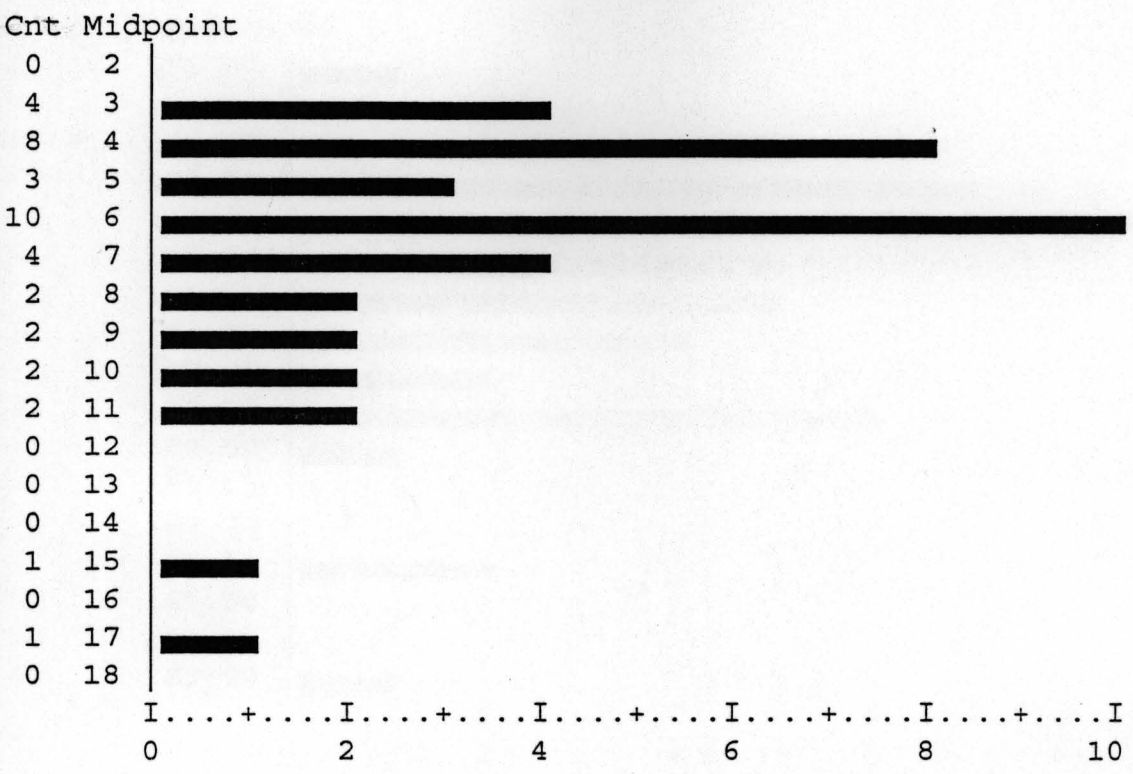


Figure C3. Frequency Histogram for Average Acquisition Cost (AVGAAC)

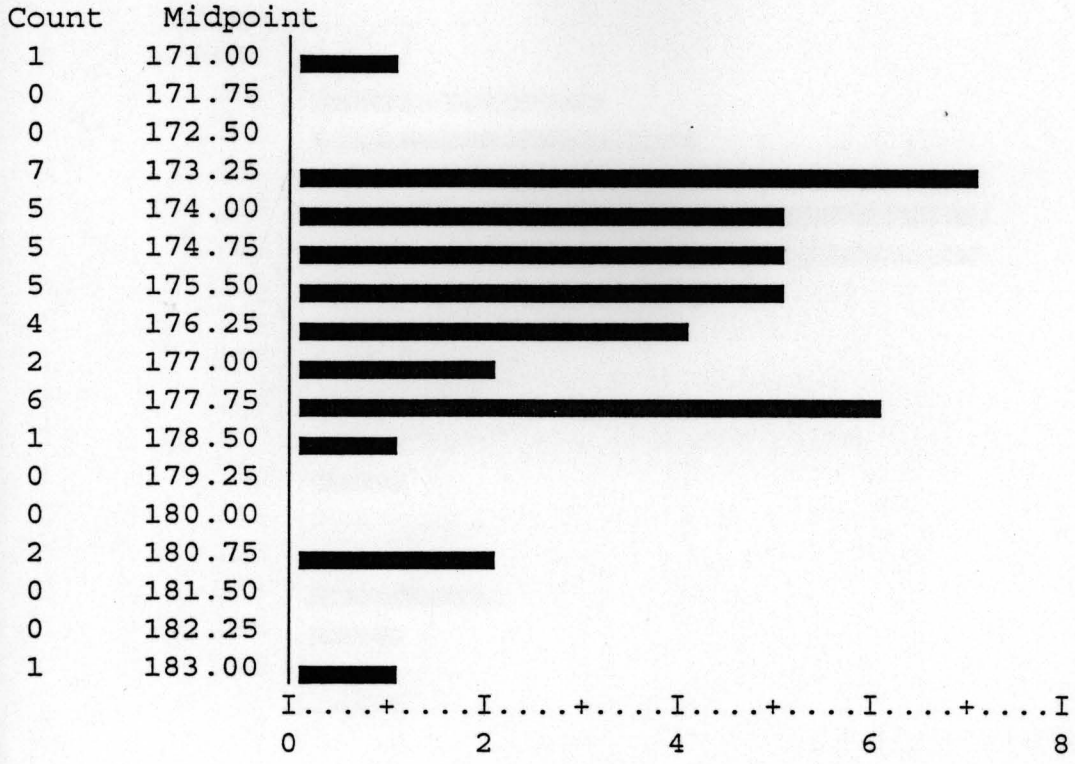


Figure C4. Frequency Histogram for Proportion of Prescriptions Covered by Medicaid (PXIX)

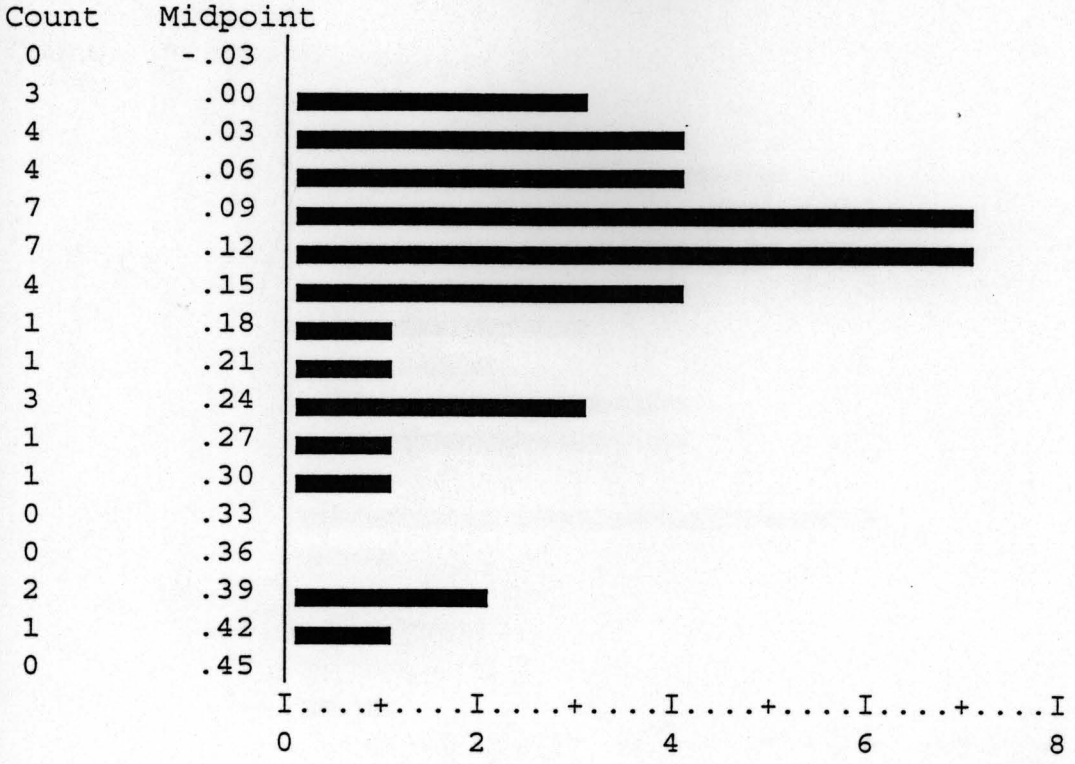


Figure C5. Frequency Histogram for Proportion of Prescriptions Covered by Major Third Party Programs (PMAJTP)

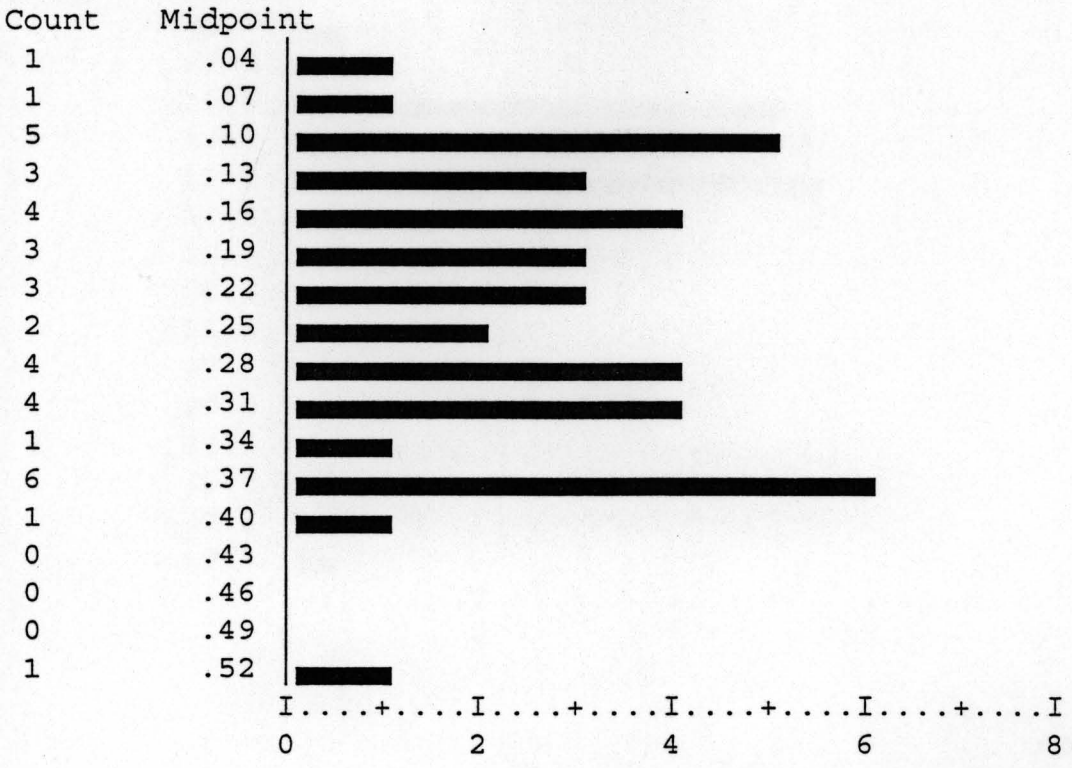


Figure C6. Frequency Histogram for Private Pay Gross Margin (PPGM)

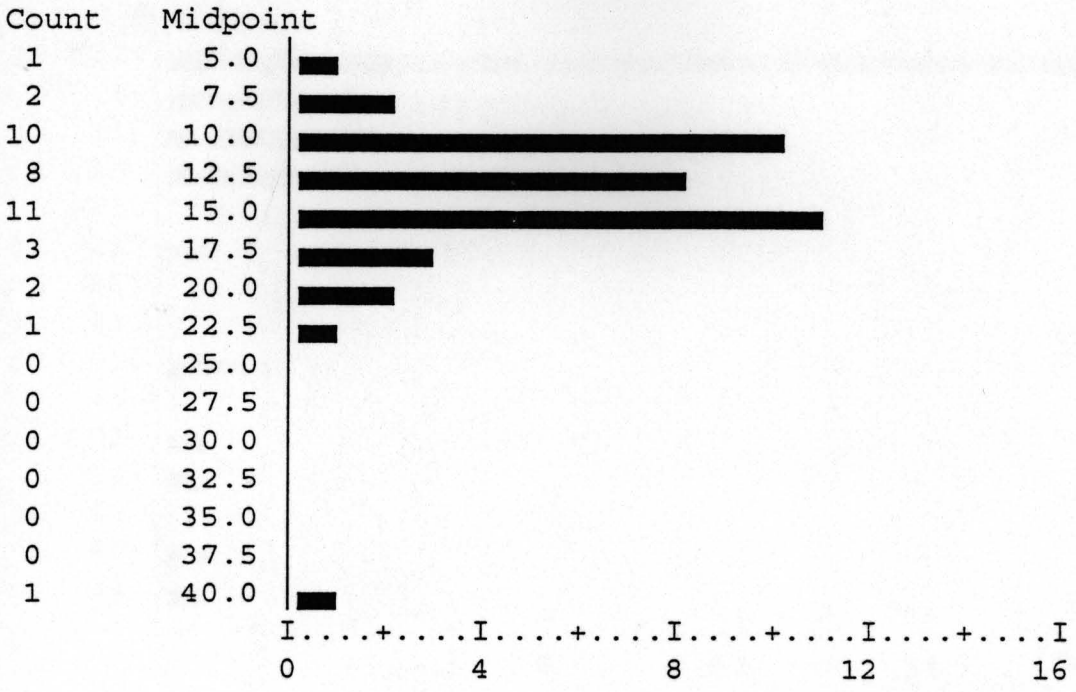


Figure C7. Frequency Histogram for Number of Competitors (LOCALPY)

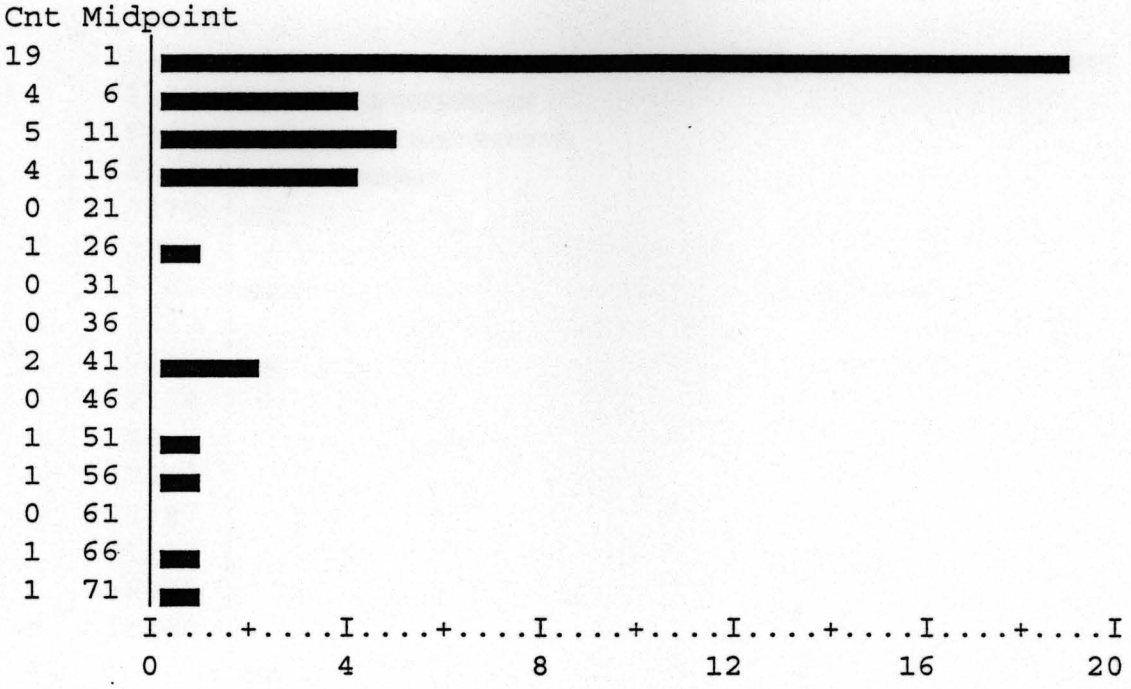


Figure C8. Frequency Histogram for Prescription Department Advertising (RXADV$)

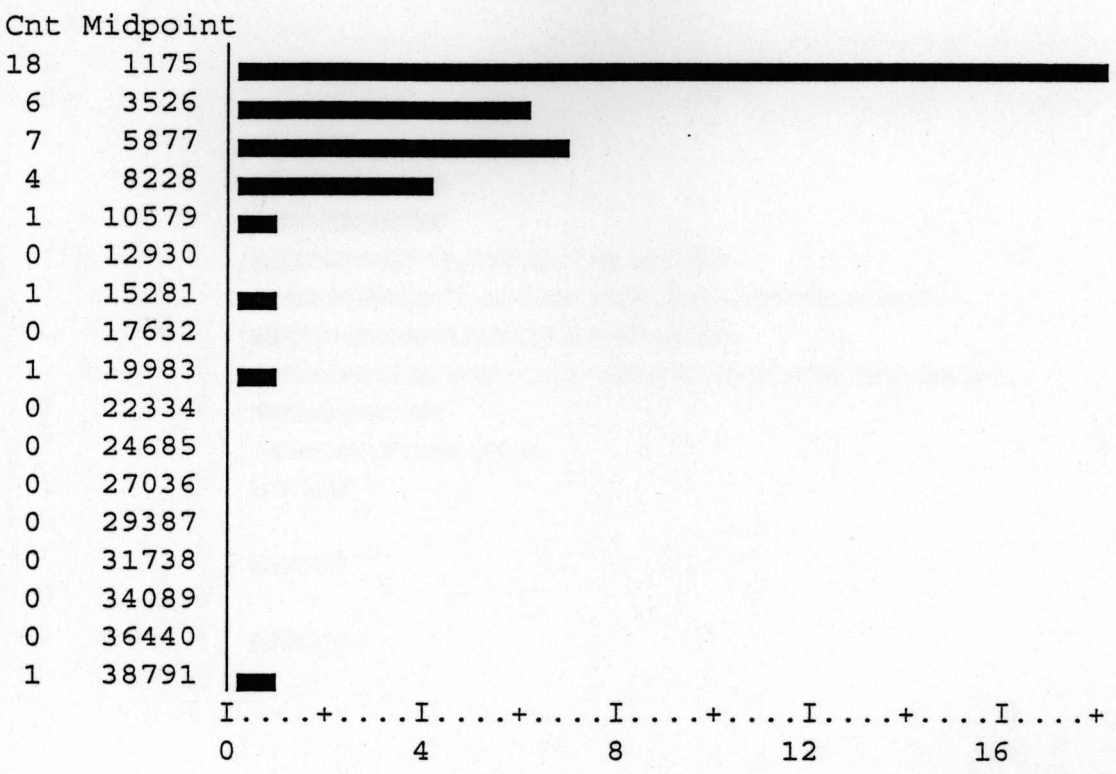


Figure C9. Frequency Histogram for Prescription Department Profit Index (PPRFIN)

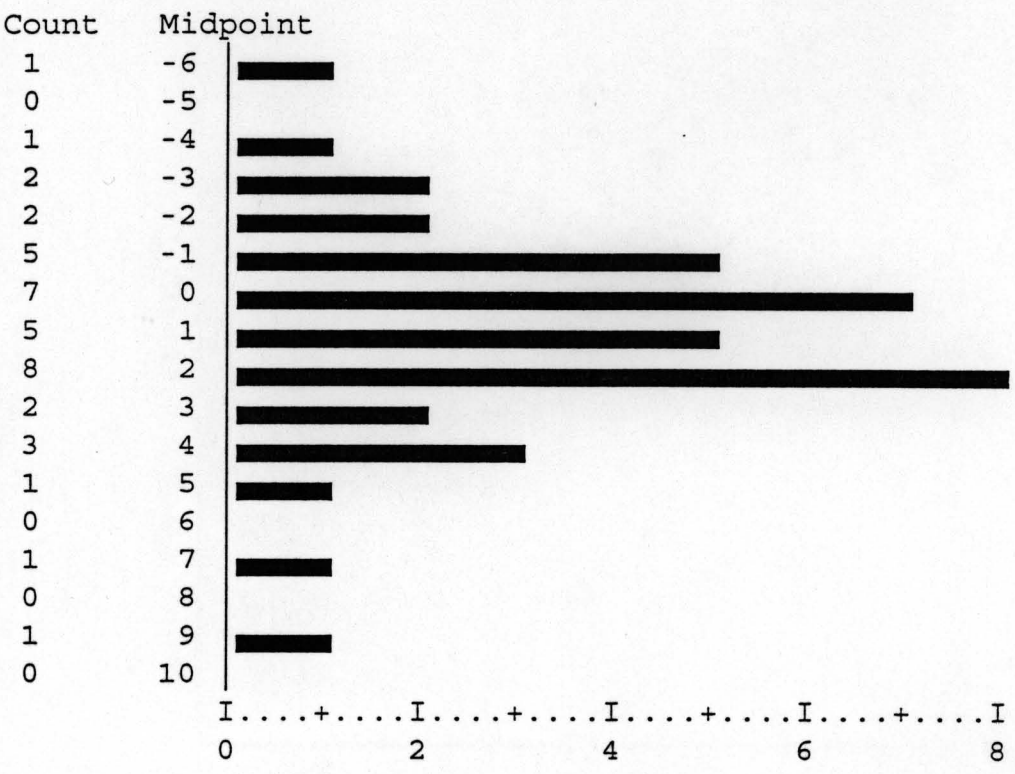


Figure C10. Bivariate Plot of Cost-of-Dispensing (CTD) and Prescription Department Profit Index (PPRFIN)

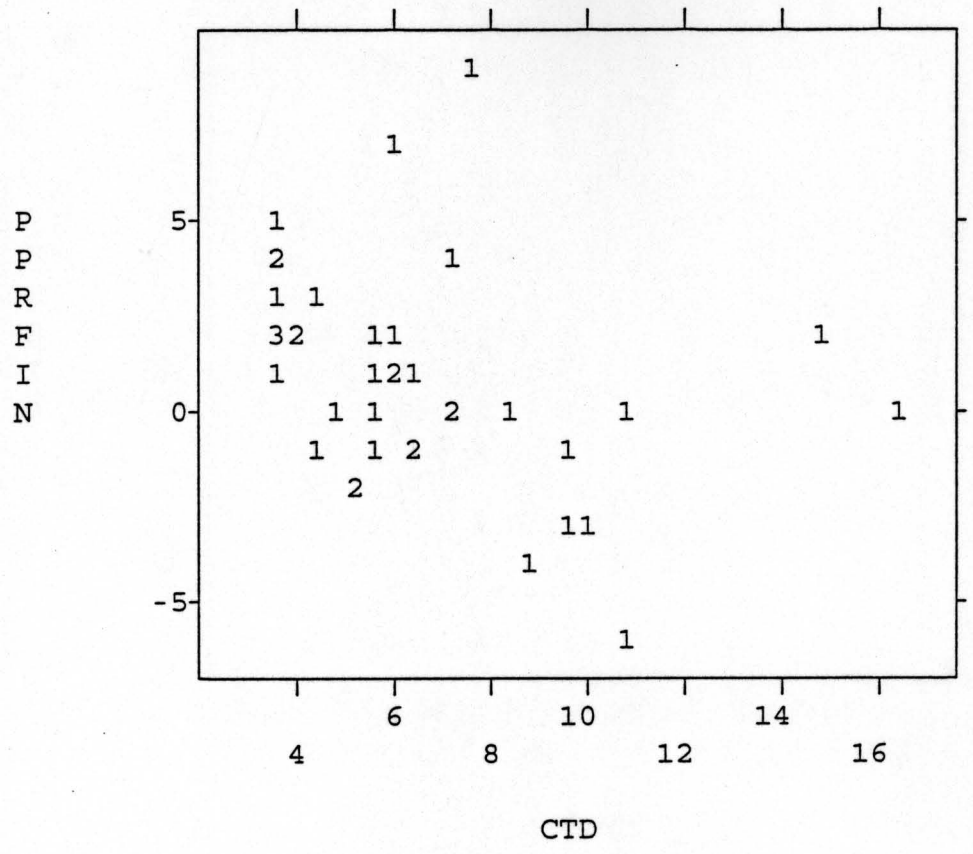


Figure C11. Bivariate Plot of Labor Expense (LABPRX) and Prescription Department Profit Index (PPRFIN)

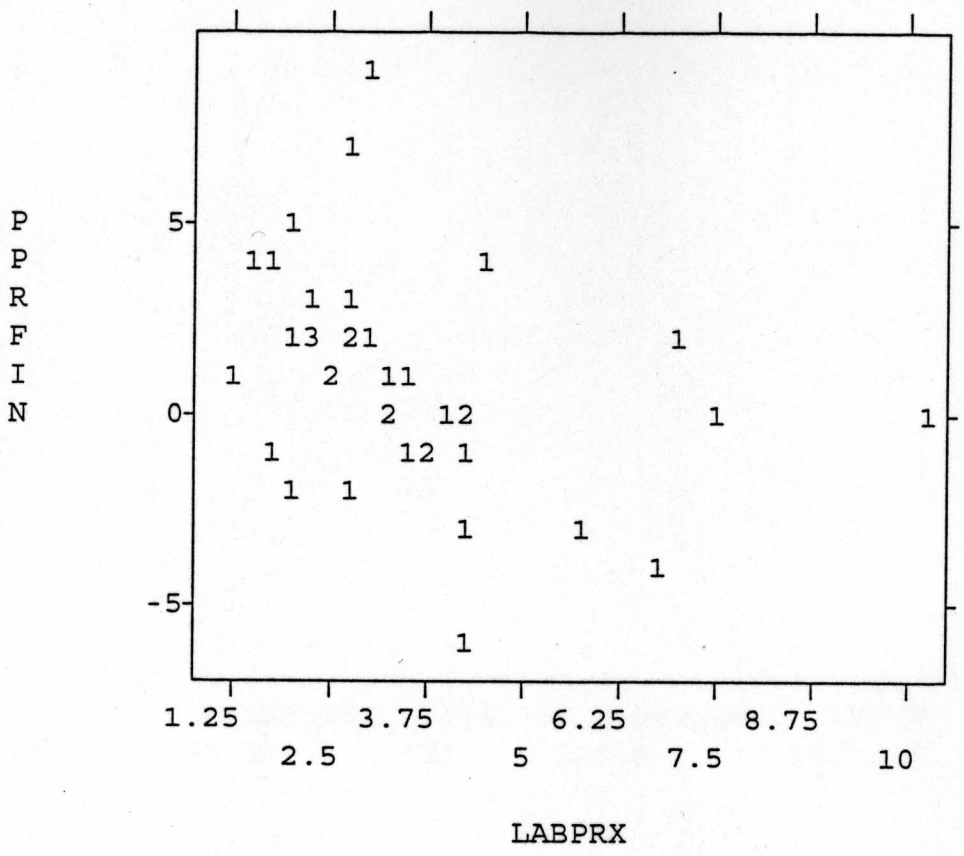


Figure C12. Bivariate Plot of Average Acquisition Cost (AVGAAC) and Prescription Department Profit Index (PPRFIN)

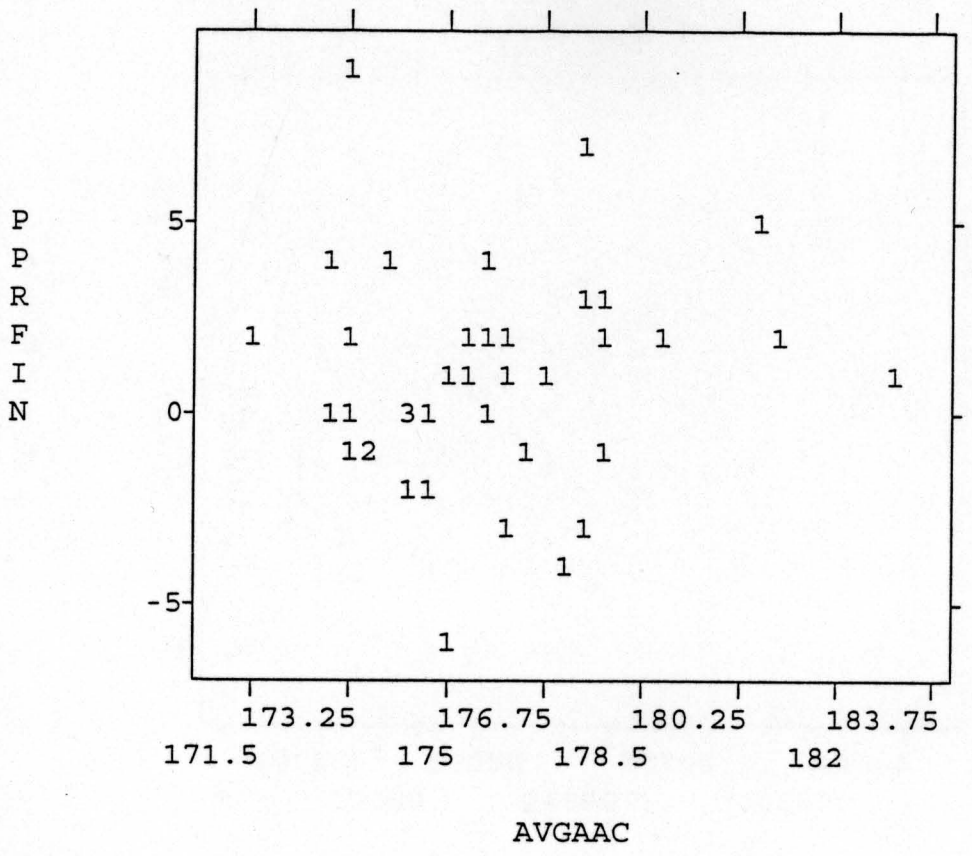


Figure C13. Bivariate Plot of Prescription Department Advertising Expense (RXADV$) and Prescription Department Profit Index (PPRFIN)

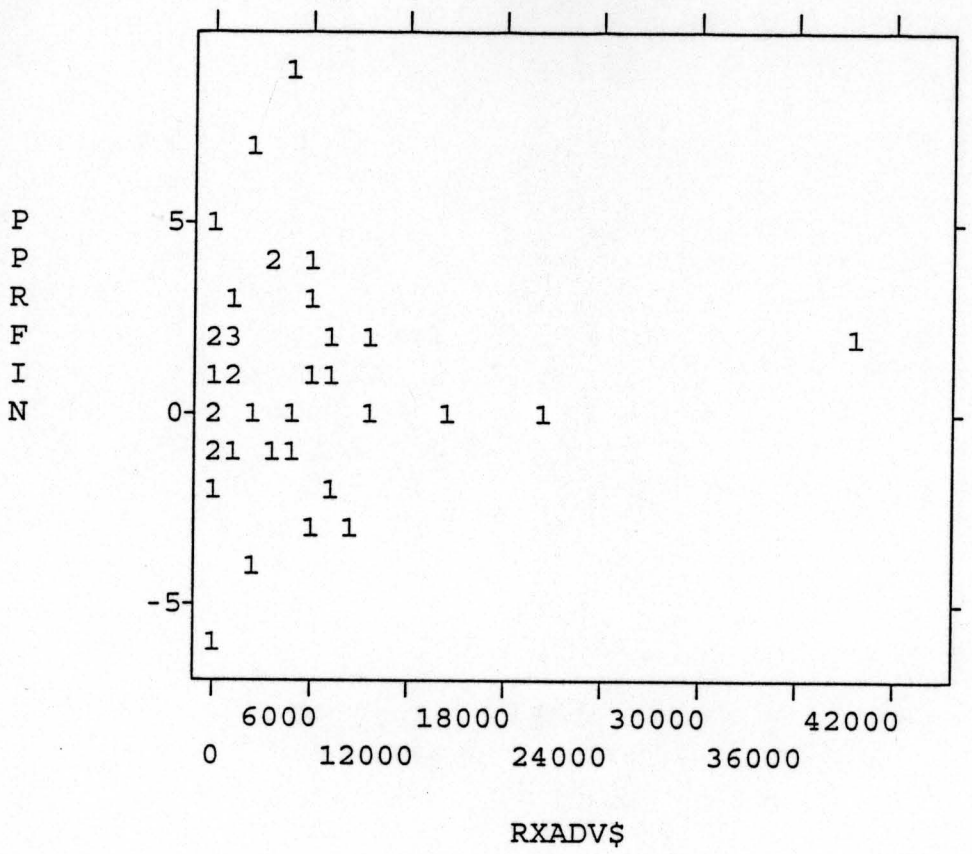


Figure C14. Bivariate Plot of Proportion of Prescriptions Covered by Medicaid (PXIX) and Prescription Department Profit Index (PPRFIN)

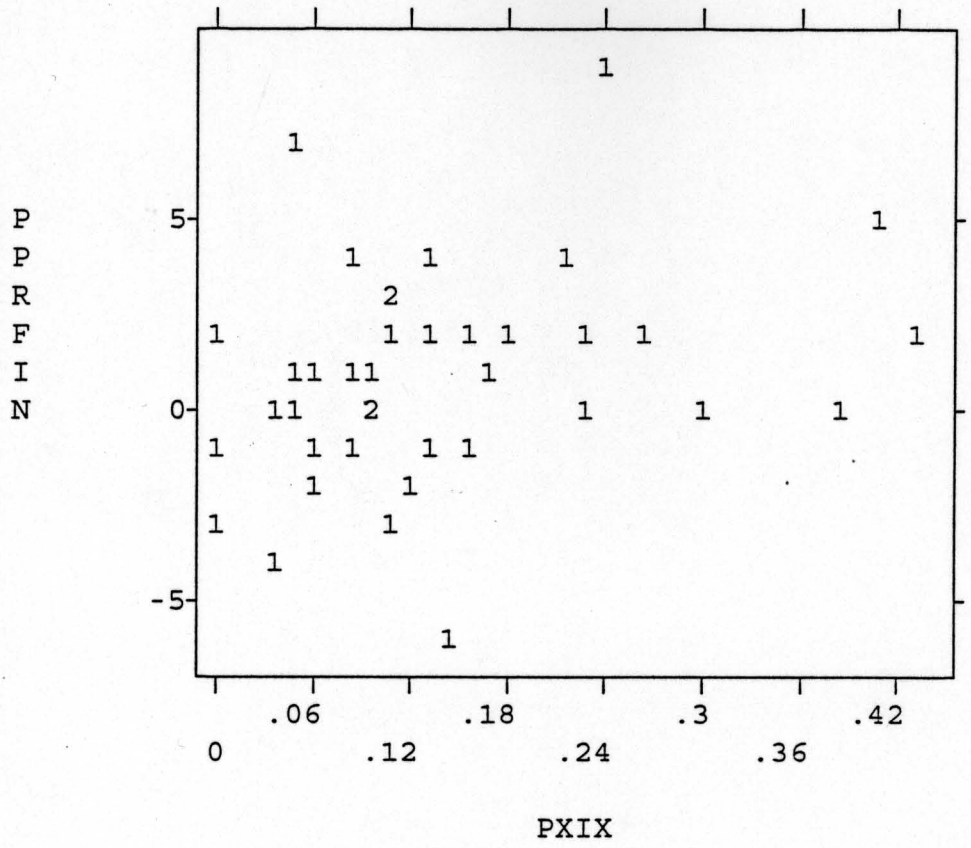


Figure C15. Bivariate Plot of Proportion of Prescriptions Covered by Major Third Party Programs (PMAJTP) and Prescription Department Profit Index (PPRFIN)

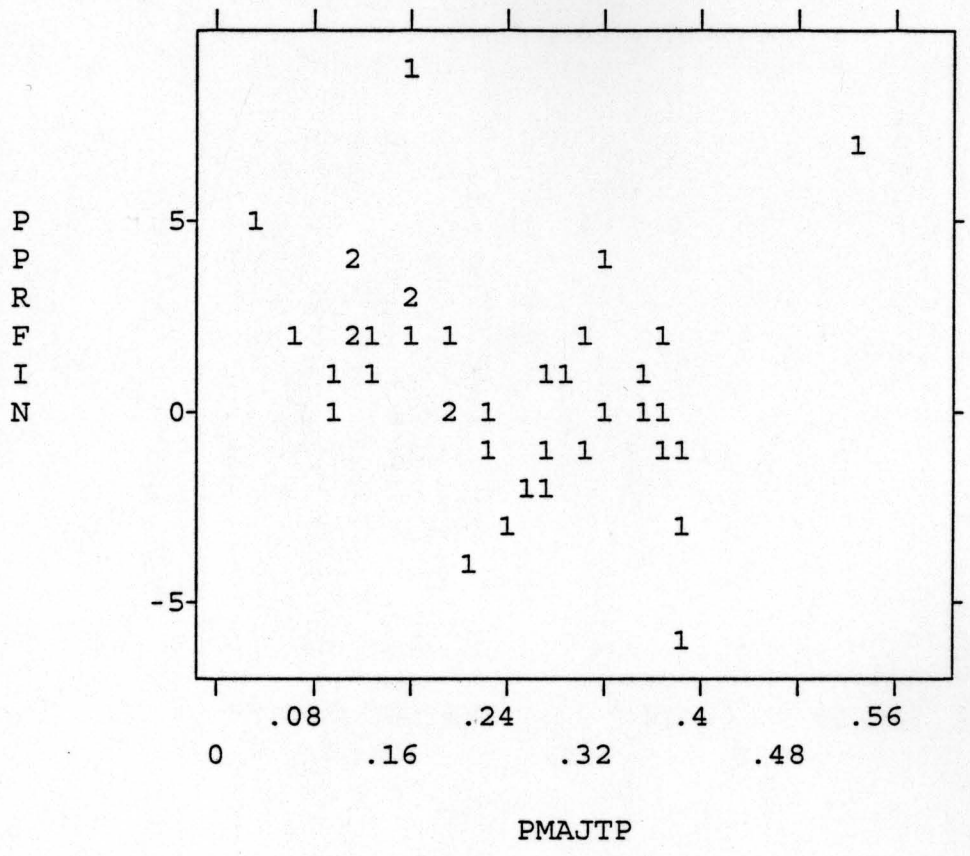


Figure C16. Bivariate Plot of Prescriptions Volume (JANTOT) and Prescription Department Profit Index (PPRFIN)

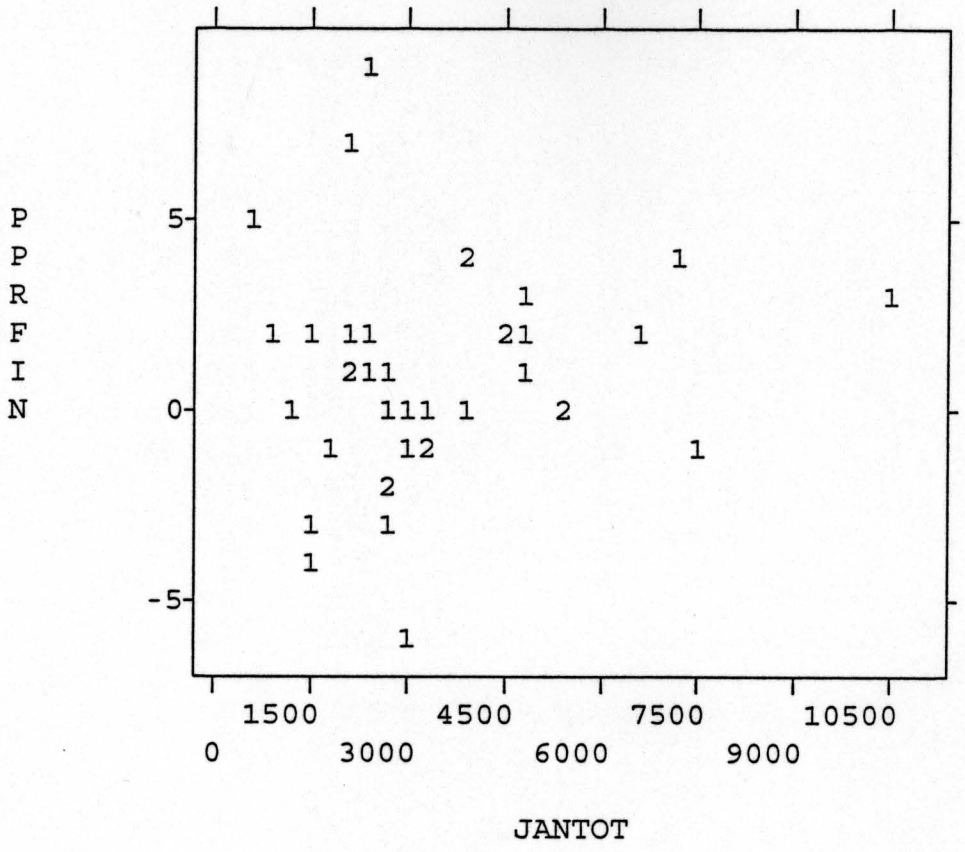


Figure C17. Bivariate Plot of Number of Competitors (LOCALPY) and Prescription Department Profit Index (PPRFIN)

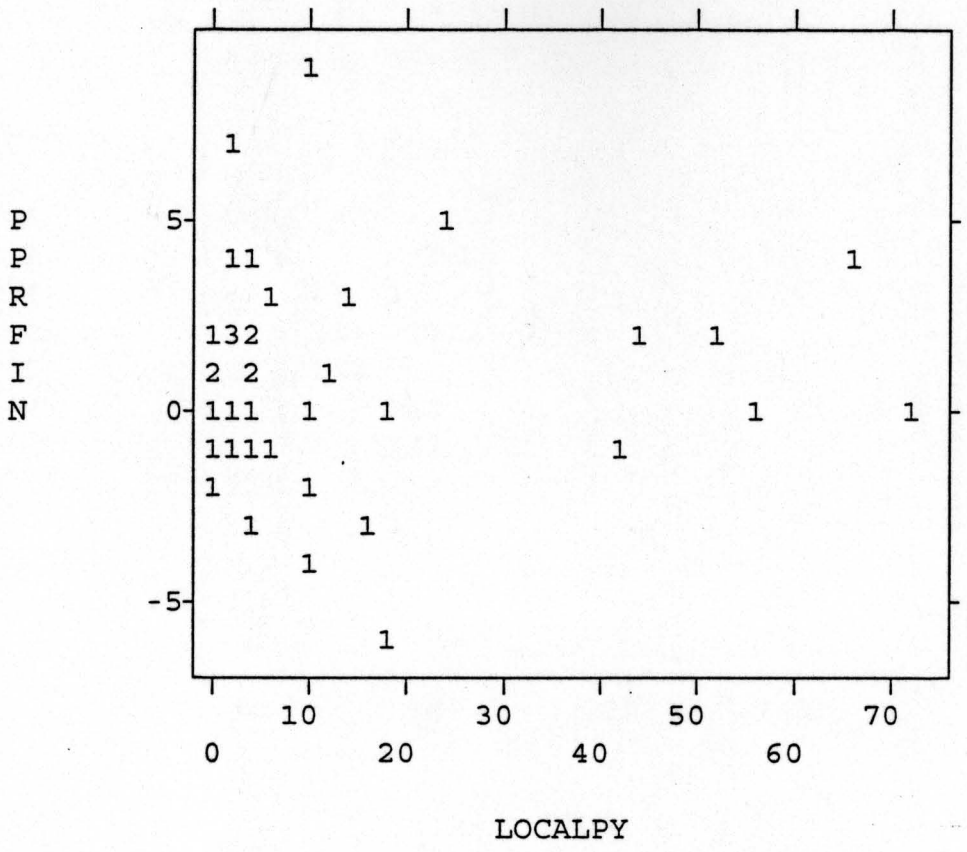
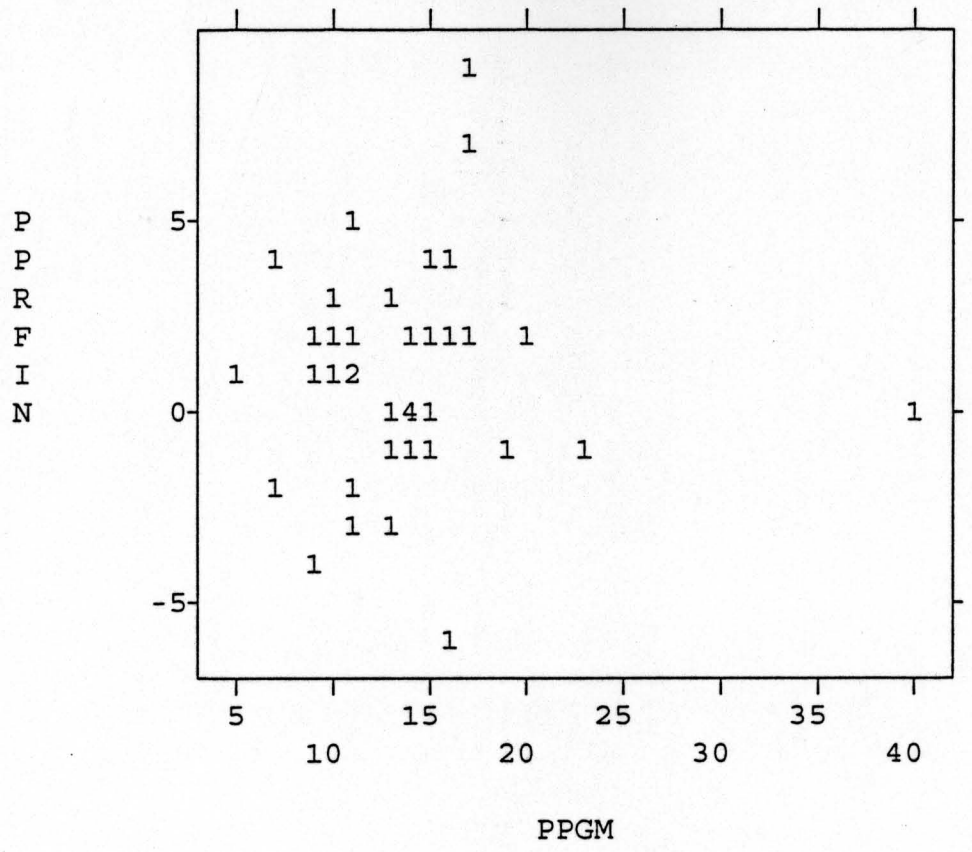


Figure C18. Bivariate Plot of Private Pay Gross Margin (PPGM) and Prescription Department Profit Index (PPRFIN)



APPENDIX D

RESIDUAL ANALYSES FOR ALL REGRESSION MODELS

Residuals: Control Variables (Using CTD)

Table D1. Residuals Statistics: Control Variables (Using CTD)

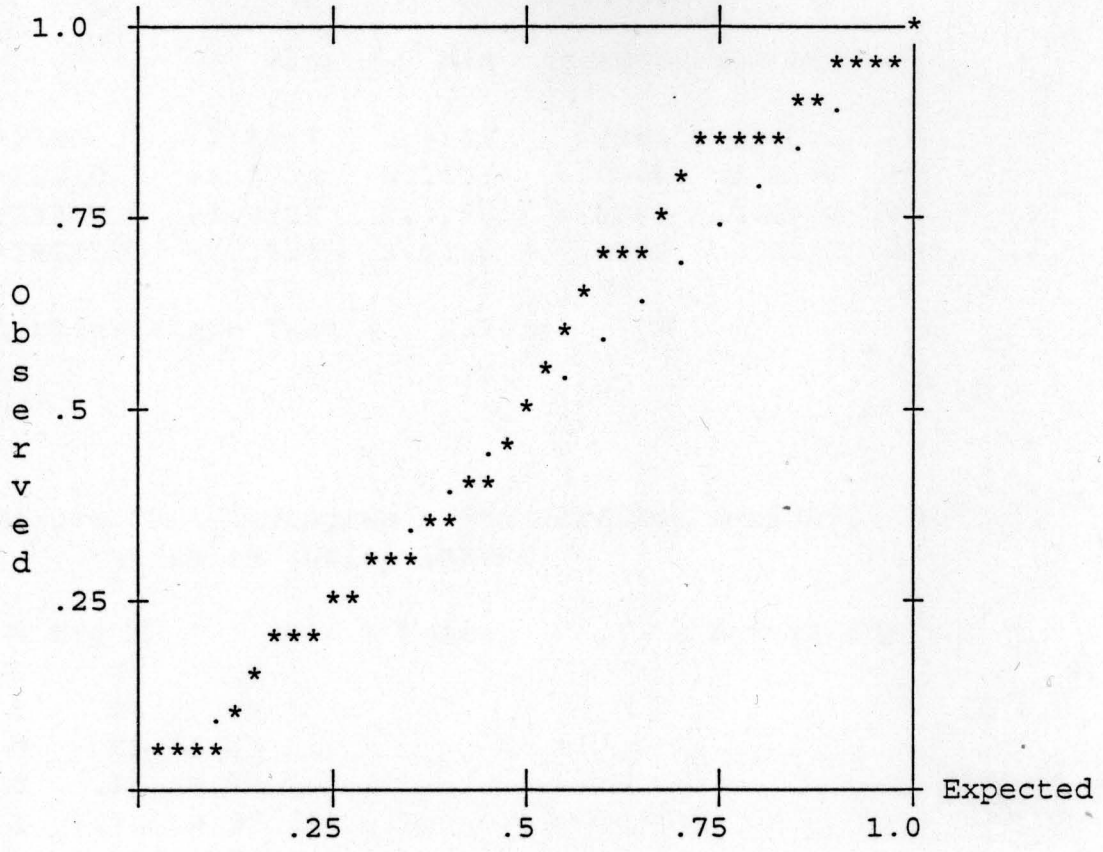
	Min	Max	Mean	Std Dev	N
*PRED	-2.3715	2.3174	.9988	1.0416	39
*RESID	-5.3817	8.6706	.0000	2.5967	39
*ZPRED	-3.2358	1.2660	.0000	1.0000	39
*ZRESID	-1.9891	3.2046	.0000	.9597	39

Durbin-Watson Test = 2.42348

Figure D1. Histogram - Standardized Residual: Control Variables (Using CTD)

```
 N Exp N      (* = 1 Cases,    . : = Normal Curve)
 1   .03   Out *
 0   .06  3.00
 0   .15  2.67
 1   .35  2.33 *
 0   .71  2.00 .
 0  1.30  1.67 .
 1  2.14  1.33 *.
 3  3.15  1.00 **:
 2  4.14   .67 ** .
 8  4.89   .33 ****:***
 8  5.16   .00 ****:***
 4  4.89  -.33 ****.
 3  4.14  -.67 ***.
 5  3.15 -1.00 **:**
 2  2.14 -1.33 *:
 0  1.30 -1.67 .
 1   .71 -2.00 :
 0   .35 -2.33
 0   .15 -2.67
 0   .06 -3.00
 0   .03   Out
```

Figure D2. Normal Probability (P-P) Plot:Standardized Residual for Control Variables (Using CTD)
(* = 1 Cases, . = Normal Curve)



Residuals: Control Variables (Using LABPRX)

Table D2. Residuals Statistics: Control Variables (Using LABPRX)

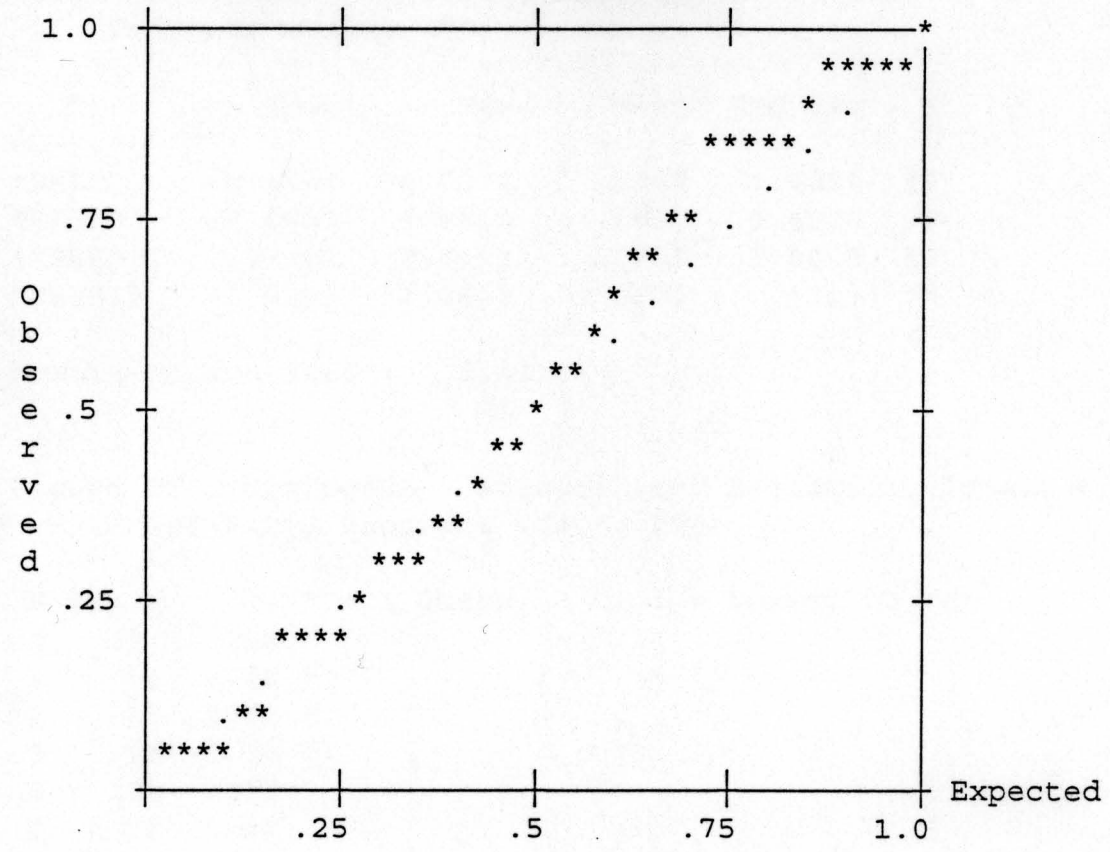
	Min	Max	Mean	Std Dev	N
*PRED	-2.6367	2.3889	.9988	1.0392	39
*RESID	-6.3712	8.1633	.0000	2.5976	39
*ZPRED	-3.4983	1.3376	.0000	1.0000	39
*ZRESID	-2.3539	3.0160	.0000	.9597	39

Durbin-Watson Test = 2.30143

Figure D3. Histogram - Standardized Residual: Control Variables (Using LABPRX)

```
 N Exp N      (* = 1 Cases,     . : = Normal Curve)
 0   .03   Out
 1   .06  3.00 *
 0   .15  2.67
 0   .35  2.33
 1   .71  2.00 :
 0  1.30  1.67 .
 0  2.14  1.33  .
 4  3.15  1.00 **:*
 3  4.14   .67 ***.
 8  4.89   .33 ****:***
 7  5.16   .00 ****:**
 4  4.89  -.33 ****.
 3  4.14  -.67 ***.
 5  3.15 -1.00 **:**
 2  2.14 -1.33 *:
 0  1.30 -1.67 .
 0   .71 -2.00 .
 1   .35 -2.33 *
 0   .15 -2.67
 0   .06 -3.00
 0   .03   Out
```

Figure D4. Normal Probability (P-P) Plot: Standardized Residual for Control Variables (Using LABPRX)
(* = 1 Cases, . = Normal Curve)



Residuals: Impact of Third-Party Programs (Using CTD)

Table D3. Residuals Statistics: Impact of Third-Party Programs (Using CTD)

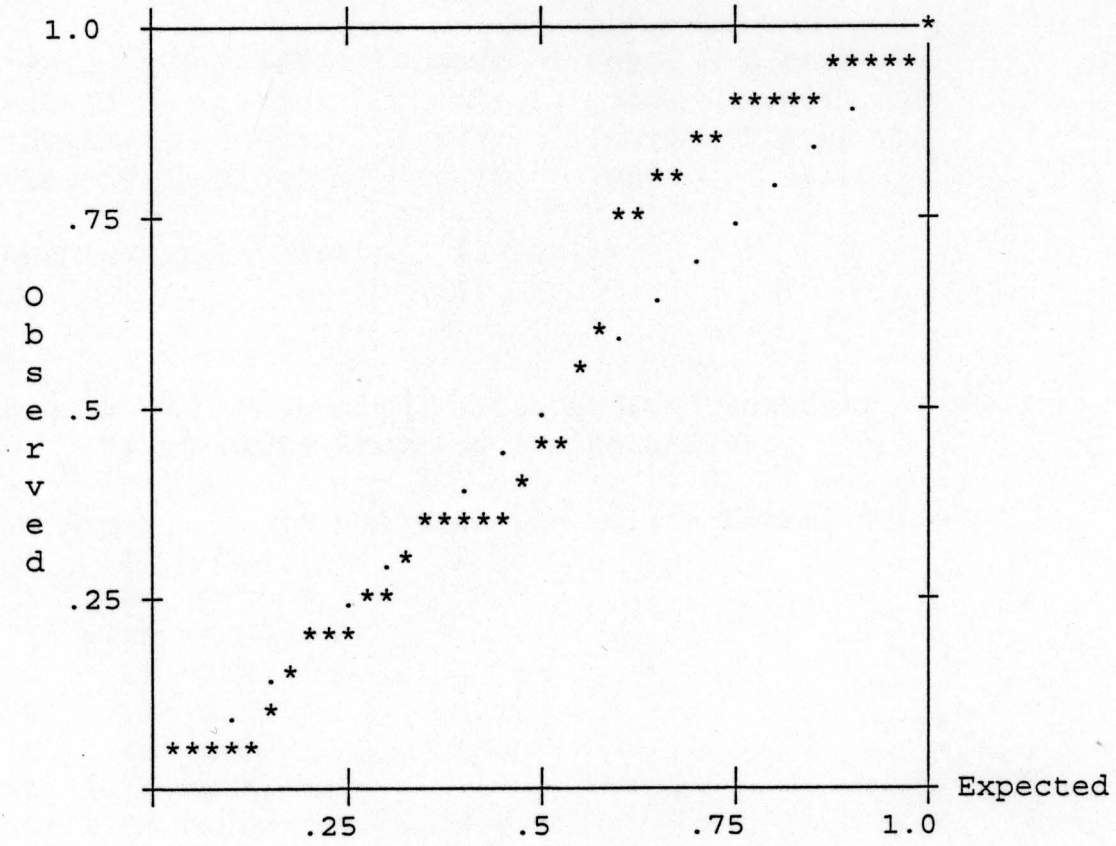
	Min	Max	Mean	Std Dev	N
*PRED	-1.4299	4.7070	.9988	1.4029	39
*RESID	-5.1693	7.9550	.0000	2.4206	39
*ZPRED	-1.7312	2.6433	.0000	1.0000	39
*ZRESID	-1.9901	3.0625	.0000	.9319	39

Durbin-Watson Test = 2.49185

Figure D5. Histogram - Standardized Residual: Impact of Third-Party Programs (Using CTD)

```
 N Exp N      (* = 1 Cases,    . : = Normal Curve)
 0   .03   Out
 1   .06  3.00 *
 1   .15  2.67 *
 0   .35  2.33
 0   .71  2.00 .
 0  1.30  1.67 .
 0  2.14  1.33  .
 2  3.15  1.00 **.
 2  4.14   .67 ** .
 9  4.89   .33 ****:****
11  5.16   .00 ****:******
 2  4.89  -.33 **  .
 3  4.14  -.67 ***.
 6  3.15 -1.00 **:***
 1  2.14 -1.33 *.
 0  1.30 -1.67 .
 1   .71 -2.00 :
 0   .35 -2.33
 0   .15 -2.67
 0   .06 -3.00
 0   .03   Out
```

Figure D6. Normal Probability (P-P) Plot: Standardized Residual for Impact of Third-Party Programs (Using CTD)
(* = 1 Cases, . = Normal Curve)



Residuals: Impact of Third-Party Programs (Using LABPRX)

Table D4. Residuals Statistics: Impact of Third-Party Programs (Using LABPRX)

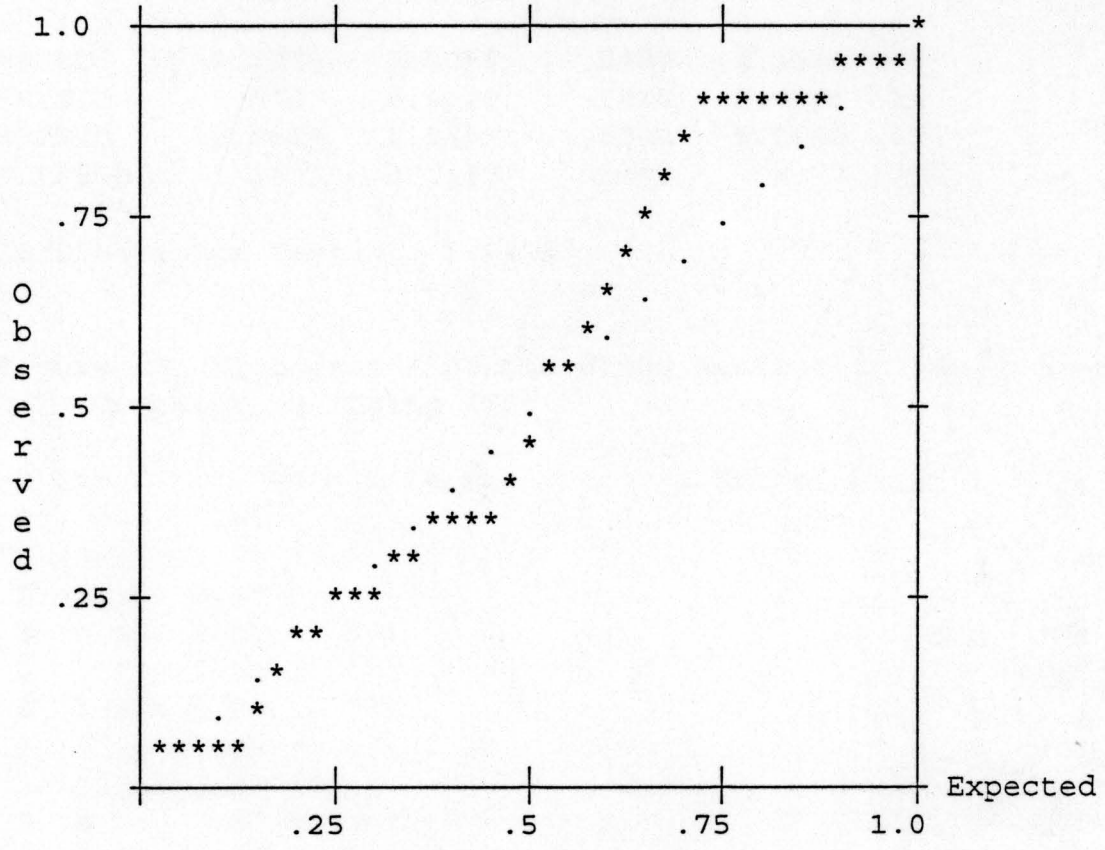
	Min	Max	Mean	Std Dev	N
*PRED	-1.9553	4.4861	.9988	1.4639	39
*RESID	-6.0114	7.3375	.0000	2.3843	39
*ZPRED	-2.0180	2.3823	.0000	1.0000	39
*ZRESID	-2.3496	2.8679	.0000	.9319	39

Durbin-Watson Test = 2.31546

Figure D7. Histogram - Standardized Residual: Impact of Third-Party Programs (Using LABPRX)

```
 N Exp N      (* = 1 Cases,     . : = Normal Curve)
 0   .03   Out
 1   .06  3.00 *
 1   .15  2.67 *
 0   .35  2.33
 0   .71  2.00 .
 0  1.30  1.67 .
 1  2.14  1.33 *.
 0  3.15  1.00   .
 4  4.14   .67 ***:
 9  4.89   .33 ****:****
 9  5.16   .00 ****:****
 4  4.89  -.33 ****.
 3  4.14  -.67 ***.
 6  3.15 -1.00 **:***
 0  2.14 -1.33  .
 0  1.30 -1.67 .
 0   .71 -2.00 .
 1   .35 -2.33 *
 0   .15 -2.67
 0   .06 -3.00
 0   .03   Out
```

Figure D8. Normal Probability (P-P) Plot: Standardized Residual for Impact of Third-Party Programs (Using LABPRX)
(* = 1 Cases, . = Normal Curve)



Residuals: Impact of Competition (Using CTD)

Table D5. Residuals Statistics: Impact of Competition (Using CTD)

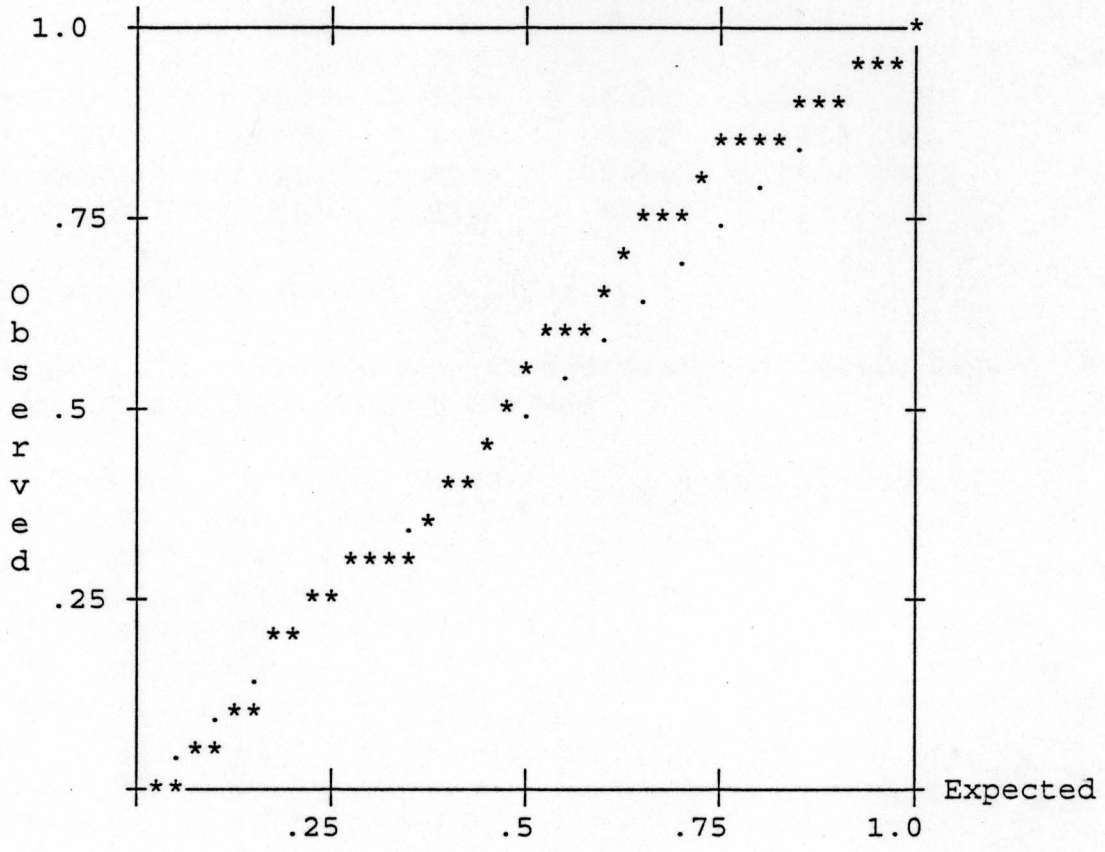
	Min	Max	Mean	Std Dev	N
*PRED	-3.5275	3.8058	.9988	1.3501	39
*RESID	-3.9727	8.4029	.0000	2.4505	39
*ZPRED	-3.3525	2.0791	.0000	1.0000	39
*ZRESID	-1.4877	3.1468	.0000	.9177	39

Durbin-Watson Test = 2.64048

Figure D9. Histogram - Standardized Residual: Impact of Competition (Using CTD)

```
 N Exp N      (* = 1 Cases,     . : = Normal Curve)
 0   .03   Out
 1   .06  3.00 *
 0   .15  2.67
 0   .35  2.33
 1   .71  2.00 :
 0  1.30  1.67 .
 1  2.14  1.33 *.
 3  3.15  1.00 **:
 3  4.14   .67 ***.
 7  4.89   .33 ****:**
 7  5.16   .00 ****:**
 4  4.89  -.33 ****.
 4  4.14  -.67 ***:
 5  3.15 -1.00 **:**
 3  2.14 -1.33 *:*
 0  1.30 -1.67 .
 0   .71 -2.00 .
 0   .35 -2.33
 0   .15 -2.67
 0   .06 -3.00
 0   .03   Out
```

Figure D10. Normal Probability (P-P) Plot: Standardized Residual for Impact of Competition (Using CTD)
(* = 1 Cases, . = Normal Curve)



Residuals: Impact of Competition (Using LABPRX)

Table D6. Residuals Statistics: Impact of Competition (Using LABPRX)

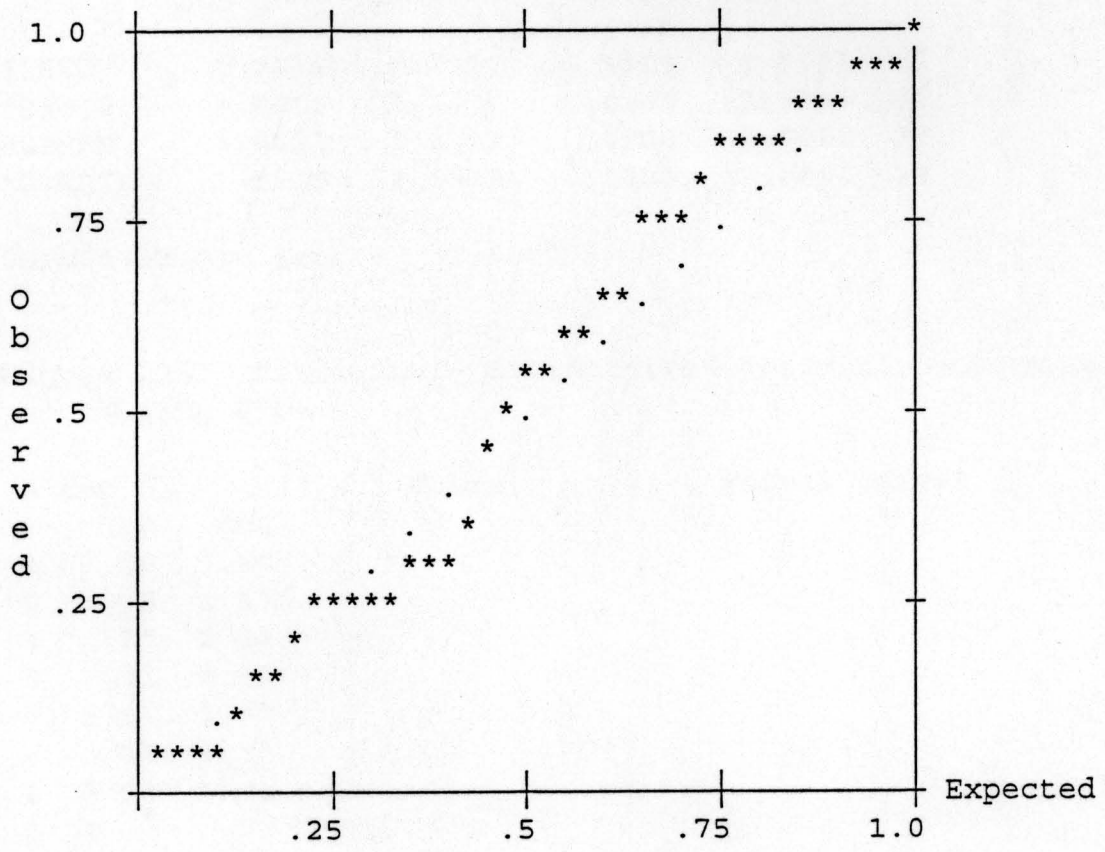
	Min	Max	Mean	Std Dev	N
*PRED	-3.8000	2.8259	.9988	1.2917	39
*RESID	-5.9093	7.6046	.0000	2.4818	39
*ZPRED	-3.7152	1.4145	.0000	1.0000	39
*ZRESID	-2.1850	2.8119	.0000	.9177	39

Durbin-Watson Test = 2.38734

Figure D11. Histogram - Standardized Residual: Impact of Competition (Using LABPRX)

```
 N Exp N      (* = 1 Cases,     . : = Normal Curve)
 0    .03   Out
 0    .06  3.00
 1    .15  2.67 *
 0    .35  2.33
 0    .71  2.00 .
 1   1.30  1.67 :
 1   2.14  1.33 *.
 3   3.15  1.00 **:
 3   4.14   .67 ***.
 6   4.89   .33 ****:*
 9   5.16   .00 ****:****
 5   4.89  -.33 ****:
 3   4.14  -.67 ***.
 5   3.15 -1.00 **:**
 1   2.14 -1.33 *.
 0   1.30 -1.67 .
 0    .71 -2.00 .
 1    .35 -2.33 *
 0    .15 -2.67
 0    .06 -3.00
 0    .03   Out
```

Figure D12. Normal Probability (P-P) Plot: Standardized Residual for Impact of Competition (Using LABPRX) (* = 1 Cases, . = Normal Curve)



Residuals: Full Model (Using CTD)

Table D7. Residuals Statistics: Full Model (Using CTD)

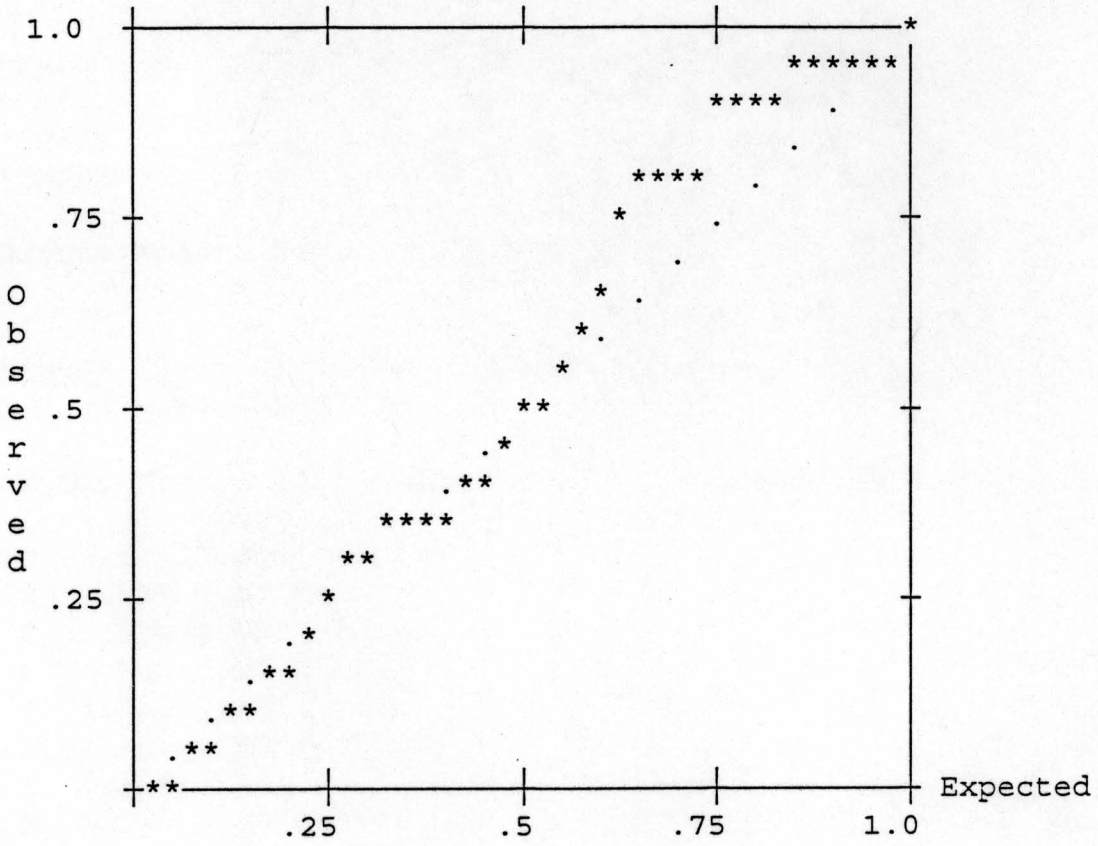
	Min	Max	Mean	Std Dev	N
*PRED	-1.8814	5.7317	.9988	1.5573	39
*RESID	-4.0062	7.7418	.0000	2.3243	39
*ZPRED	-1.8495	3.0392	.0000	1.0000	39
*ZRESID	-1.5315	2.9595	.0000	.8885	39

Durbin-Watson Test = 2.68527

Figure D13. Histogram - Standardized Residual: Full Model (Using CTD)

```
 N Exp N      (* = 1 Cases,     . : = Normal Curve)
 0   .03   Out
 1   .06  3.00 *
 0   .15  2.67
 1   .35  2.33 *
 0   .71  2.00 .
 0  1.30  1.67 .
 0  2.14  1.33  .
 1  3.15  1.00 * .
 4  4.14   .67 ***:
11  4.89   .33 ****:******
 6  5.16   .00 ****:*
 4  4.89  -.33 ****.
 5  4.14  -.67 ***:*
 4  3.15 -1.00 **:*
 1  2.14 -1.33 *.
 1  1.30 -1.67 :
 0   .71 -2.00 .
 0   .35 -2.33
 0   .15 -2.67
 0   .06 -3.00
 0   .03   Out
```

Figure D14. Normal Probability (P-P) Plot: Standardized Residual for Full Model (Using CTD)
(* = 1 Cases, . = Normal Curve)



Residuals: Full Model (Using LABPRX)

Table D8. Residuals Statistics: Full Model (Using LABPRX)

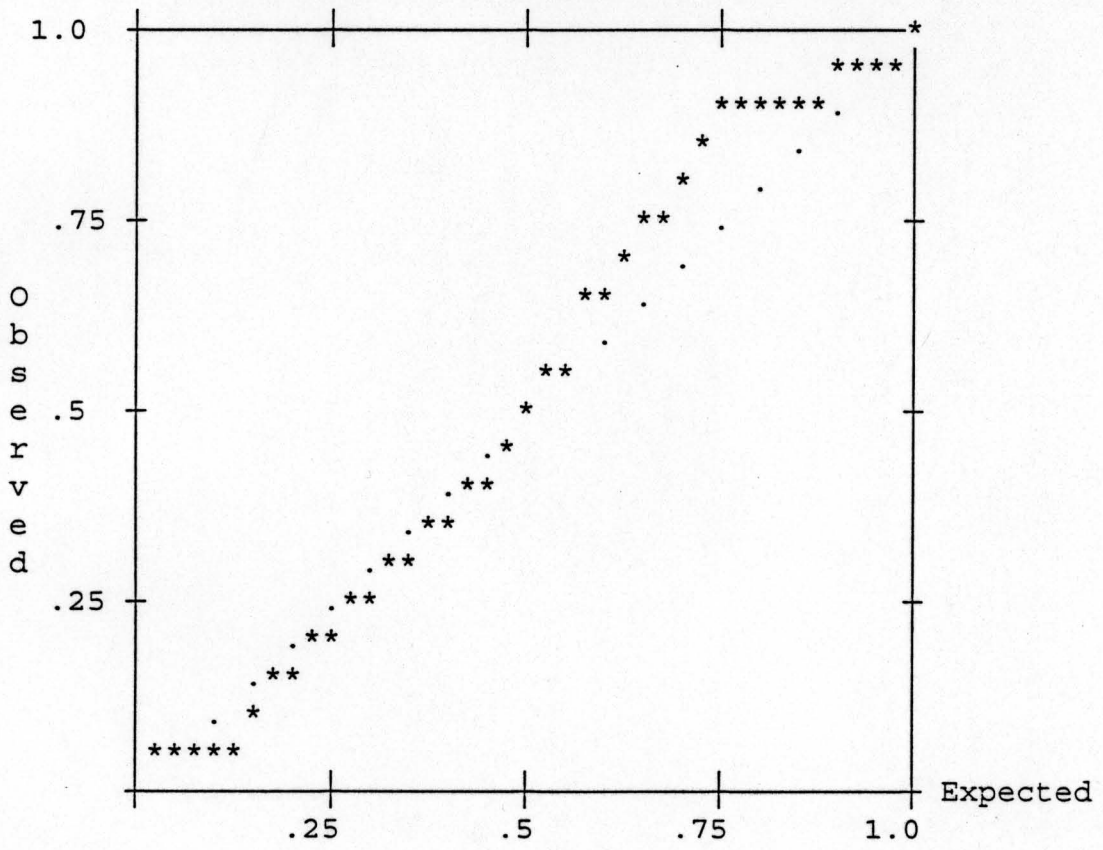
	Min	Max	Mean	Std Dev	N
*PRED	-2.8014	5.2229	.9988	1.5946	39
*RESID	-5.4009	6.8609	.0000	2.2988	39
*ZPRED	-2.3831	2.6489	.0000	1.0000	39
*ZRESID	-2.0875	2.6518	.0000	.8885	39

Durbin-Watson Test = 2.42485

Figure D15. Histogram - Standardized Residual: Full Model (Using LABPRX)

```
 N Exp N      (* = 1 Cases,     . : = Normal Curve)
 0   .03   Out
 0   .06  3.00
 2   .15  2.67 **
 0   .35  2.33
 0   .71  2.00 .
 0  1.30  1.67 .
 1  2.14  1.33 *.
 0  3.15  1.00   .
 5  4.14   .67 ***:*
 7  4.89   .33 ****:**
 9  5.16   .00 ****:****
 4  4.89  -.33 ****.
 5  4.14  -.67 ***:*
 4  3.15 -1.00 **:*
 1  2.14 -1.33 *.
 0  1.30 -1.67 .
 1   .71 -2.00 :
 0   .35 -2.33
 0   .15 -2.67
 0   .06 -3.00
 0   .03   Out
```

Figure D16. Normal Probability (P-P) Plot: Standardized Residual for Full Model (Using LABPRX)
(* = 1 Cases, . = Normal Curve)



APPENDIX E

ANALYSES WITH LABOR EXPENSE AS AVERAGE COST VARIABLE

Table E1. Correlation Matrix for Independent Variables

	January RX Volume	Average AAC	Private-Pay Gross Margin	RX Advertising Expense	Number of Competitors	Proportion Major Private TP	Proportion Medicaid
Labor Expense	0.026	-0.157	0.392*	0.460**	-0.002	0.167	0.126
January RX Volume	-	-0.016	0.204	0.178	0.080	0.008	-0.205
Average AAC	-	-	-0.266	-0.065	-0.054	0. 113	-0.139
Private-Pay Gross Margin	-	-	-	0.037	0.393**	0.127	0.259
RX Advertising Expense	-	-	-	-	-0.162	0.075	0.161
Number of Competitors	-	-	-	-	-	-0.164	0.272
Proportion Major Private TP	-	-	-	-	-	-	-0.451*

* $p<0.01$, **$p<0.05$

Table E2. Regression Results: Labor Expense with Control Variables

Variable	Coefficient	SE	T-statistic	p-value
Average Acquisition Cost	0.0365	0.1847	0.197	0.8446
RX Labor Expense	-0.5467	0.2427	-2.253	0.0307
RX Volume	1.157×10^{-4}	2.193×10^{-4}	0.527	0.6012
Constant	-3.8773	32.6184	-0.119	0.9061
F (df=3,35)			1.867	0.1531
R-squared	0.1380			

Table E3. Regression Results: Labor Expense and Impact of Third-Party Programs

Variable	Coefficient	SE	T-statistic	p-value
Average Acquisition Cost	0.0980	0.1768	0.555	0.5830
RX Labor Expense	-0.5841	0.2398	-2.436	0.0204
RX Volume	2.167×10^{-4}	2.135×10^{-4}	1.015	0.3176
Medicaid	8.9756	4.6197	1.943	0.0606
Major Third Parties	-1.7869	4.3006	-0.416	0.6805
Constant	-15.7212	31.2139	-0.504	0.6178
F (df=5,33)			2.4879	0.0511
R-squared	0.2738			

Table E4. Regression Results: Labor Expense and Impact of Competition

Variable	Coefficient	SE	T-statistic	p-value
Average Acquisition Cost	0.0941	0.1899	0.496	0.6236
RX Labor Expense	-0.8652	0.3035	-2.851	0.0076
RX Volume	-7.538×10^{-6}	2.308×10^{-4}	-0.033	0.9741
Private Pay Gross Margin	0.1310	0.0994	1.319	0.1967
Number of Competitors	-0.0076	0.0253	-0.302	0.7644
RXAdvertising Expense	9.713×10^{-5}	7.217×10^{-5}	1.346	0.1878
Constant	-14.6321	33.6930	-0.434	0.6670
F (df=6,32)			1.4447	0.2286
R-squared	0.2131			

Table E5. Regression Results: Labor Expense in Full Model

Variable	Coefficient	SE	T-statistic	p-value
Average Acquisition Cost	0.1460	0.1847	0.791	0.4354
RX Labor Expense	-0.7969	0.2920	-2.729	0.0105
RX Volume	1.094×10^{-4}	2.403×10^{-4}	0.455	0.6522
Medicaid	6.9852	5.3161	1.314	0.1988
Major Third Parties	-3.855	4.6320	-0.832	0.4119
Private Pay Gross Margin	0.1170	0.1032	1.134	0.2658
Number of Competitors	-0.0227	-0.0251	-0.903	0.3735
RXAdvertising Expense	6.624×10^{-5}	7.273×10^{-5}	0.911	0.3697
Constant	23.9041	32.6325	-0.733	0.4695
F (df=8,30)			1.8044	0.1155
R-squared	0.3249			