1998

An Analysis of Reimbursement Methodologies and Cost Containment Policies in Medicaid Inpatient Hospital and Pharmaceuticals.

Etienne Elmer Pracht
Louisiana State University and Agricultural & Mechanical College

INFORMATION TO USERS

This manuscript has been reproduced from the microfilm master. UMI films the text directly from the original or copy submitted. Thus, some thesis and dissertation copies are in typewriter face, while others may be from any type of computer printer.

The quality of this reproduction is dependent upon the quality of the copy submitted. Broken or indistinct print, colored or poor quality illustrations and photographs, print bleedthrough, substandard margins, and improper alignment can adversely affect reproduction.

In the unlikely event that the author did not send UMI a complete manuscript and there are missing pages, these will be noted. Also, if unauthorized copyright material had to be removed, a note will indicate the deletion.

Oversize materials (e.g., maps, drawings, charts) are reproduced by sectioning the original, beginning at the upper left-hand corner and continuing from left to right in equal sections with small overlaps. Each original is also photographed in one exposure and is included in reduced form at the back of the book.

Photographs included in the original manuscript have been reproduced xerographically in this copy. Higher quality 6" x 9" black and white photographic prints are available for any photographs or illustrations appearing in this copy for an additional charge. Contact UMI directly to order.

UMI

A Bell & Howell Information Company
300 North Zeeb Road, Ann Arbor MI 48106-1346 USA
313/761-4700 800/521-0600

AN ANALYSIS OF REIMBURSEMENT METHODOLOGIES AND COST CONTAINMENT POLICIES IN MEDICAID INPATIENT HOSPITAL AND PHARMACEUTICALS

A Dissertation

Submitted to the Graduate Faculty of the
Louisiana State University and
Agricultural and Mechanical College
in partial fulfillment of the
requirements for the degree of
Doctor of Philosophy

in

The Department of Economics

by
Etienne E. Pracht
B.A., New College of The University of South Florida, 1989
M.S., Louisiana State University, 1995
May 1998

To Jodi.

ACKNOWLEDGEMENTS

I am especially grateful to my mentor, Professor William J. Moore, who was instrumental to my dissertation's completion. His advice and insight were invaluable, particularly in the design phase. I am also thankful to Professor R. Carter Hill, whose econometric guidance was crucial in the estimation phase of this research. In addition, Professor Robert Newman provided many useful theoretical comments. I would also like to thank Professor Doris Carver for serving on my dissertation committee. Finally, a most special thanks is due to Jodi, who provided that rarest of commodities, unconditional support throughout my graduate career.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

This dissertation consists of three essays. The first essay provides an analysis of the interaction between special interest groups, public interest factors, median voters' tastes and preferences regarding the provision of medical services for the poor, and cost containment policies on one side, and drug reimbursement levels, the size of state Medicaid programs, and the size of states' drug budgets on the other. The relative strengths of special interest are shown to be one of the most important determinants of drug reimbursement levels and drug expenditures. The median voters' preferences significantly explain the size of states' Medicaid programs. The results verify the existence of substantial variation in state Medicaid programs, and point to potentially growing disparities as a result of current policies.

The second essay examines alternatives to the traditional retrospective fee for service (FFS) payment mechanisms regarding Medicaid inpatient hospital services. These alternatives may be grouped into direct price or utilization controls, particularly, prospective payment and coverage limitations, and managed care, either in the form of fee for service primary care case management, or risk based enrollment in prepaid health plans or health maintenance organizations. Both special interest groups and median voter variables are shown to have significant explanatory power in the adoption of these alternative payment mechanisms.

The third essay uses a system of six equations to examine the relative effects of direct and market driven cost containment policies, relating to the general inpatient hospital component of Medicaid. Direct cost containment policies, consisting of diagnosis related groups prospective payment systems and rate-of-increase control

based prospective payment systems are found to be effective. To a lesser extend. Managed care principles also generate savings. Furthermore, significant substitute and complementary relationships between program components emphasize the importance of system-wide analysis.

CHAPTER I

INTRODUCTION

Health care is one of the fastest growing industries in our economy. Both private and public health care expenditures have grown substantially since World War II, and particularly since the latter half of the 1960s when the Medicare and Medicaid programs were established. This dissertation consists of three essays concerning Medicaid expenditures. The issue that binds these three essays is reimbursement to providers participating in the Medicaid program.

States have traditionally had substantial autonomy regarding the administration of their Medicaid programs. This freedom encompasses eligibility criteria, the types and scopes of services offered, and rates and methods of reimbursement. This flexibility enjoyed by states has resulted in substantial variety between programs with important implications regarding the treatment of the poor. To the extent that state level factors result in differences in services covered, discrepancies may be expected in the medical treatment of the nation's poor across states.

The first essay focuses on the pharmaceutical drug component of Medicaid. The principal thesis of this essay is that the variation in reimbursement rates of the two main components of the prescription drug price is primarily the result of the relative strengths of interest groups. A secondary hypothesis discussed in this essay is that interest groups have an indirect impact on pharmaceutical drug expenditure levels as well. The second essay provides an analysis of the reasons why states have adopted certain cost containment policies relating to the inpatient hospital component of Medicaid. These cost containment policies often take the form of alternatives to the traditional fee for

service reimbursement methodologies, such as prospective payment mechanisms or managed care principles. The relative strengths of interest groups and the preferences of the median voter are hypothesized to determine the probability of a state adopting these alternative reimbursement systems. The third essay is an extension of the second, analyzing the relative effectiveness of the cost containment mechanisms employed by states. These costs containment systems include direct control over prices and utilization, market driven managed care, and indirect control through the manipulation of eligibility standards.

CHAPTER II

AN ANALYSIS OF THE VARIATION IN REIMBURSEMENT RATES OF PHARMACEUTICAL DRUGS UNDER MEDICAID

I have no great faith in political arithmetic.
Adam Smith (1776)

SECTION II.I: INTRODUCTION

One of the most frequently debated issues in the government is the upward spiraling cost of healthcare entitlement programs. All parties involved commonly agree that reducing the growth rates, if not the absolute sizes, of the programs is essential. Some have argued for relinquishing control over these programs to the individual states. To better evaluate this debate and the consequences of suggested solutions to the cost problem, it is crucial to have a clear understanding of the driving forces behind expenditure patterns. States have traditionally been given extensive autonomy regarding the logistics of one of these entitlement programs, particularly Medicaid. This makes it an ideal vehicle for analyzing the impact of transferring control over entitlement programs from the federal to the state level.

One component of Medicaid expenditures, which has received increased attention in recent years, involves the reimbursement of pharmaceutical drugs. Although reimbursement of pharmaceutical drugs is not required under Medicaid law, all state Medicaid programs provide some prescription drug benefits. Real national pharmaceutical drug expenditures as a component of Medicaid more than doubled from 1985 to 1994, increasing from $2,031million to $4,177million, claiming approximately seven percent of total expenditures of the program.[1]

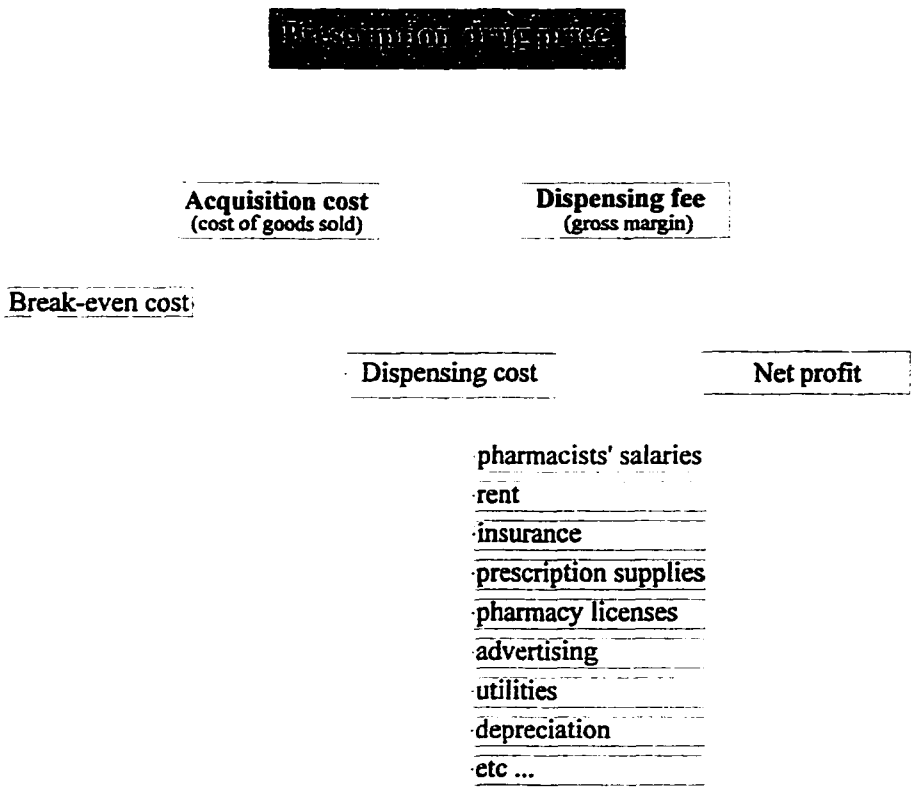


Figure 2.1 : Break down of the selling price of a pharmaceutical drug.
Source : Francis A. Marino, Principles of Pharmaceutical Accounting, Henry Kimpton Publishers, London, 1980.

The main focus of this paper is the reimbursement of prescription drugs covered under the Medicaid program. The starting point for the analysis is the selling price of prescription drugs, which can be broken down into an ingredients cost component, also referred to as the pharmacist's acquisition cost, and a dispensing fee component. The dispensing fee, in turn, is divided into dispensing cost and a net profit; acquisition and dispensing costs constitute the break-even cost for the pharmacist (see Figure 2.1).

Ingredient costs and dispensing fees are reimbursed by state Medicaid programs through separate procedures. These components will be discussed in more detail in section I.II.

Although little variation is observed across states, particularly in the average ingredient costs per prescription, substantial differences exists in the level of reimbursement of Medicaid prescription drugs. A cursory examination of descriptive statistics, albeit not conclusive, provides some evidence. The mean estimated ingredient cost per drug for 1991 was calculated at $18.16 with a standard deviation of 1.77 (the standard deviation drops to 1.19 when one outlying observation was removed)[2]. In contrast, the mean percentage markup (see Section II.B) for that year was 7.35% with a standard deviation of 3.44. A similar, but less conspicuous pattern was found when comparing the estimated dispensing costs and fees for that year. One goal of this paper is to explain this variation, a good understanding of which is crucial for the construction of effective and efficient cost-control legislation.

Federal, and more importantly, state Medicaid policies play an important role in the level of prescription drug expenditures. During the past two decades state governments have attempted to reduce the growth rate of Medicaid drug expenditures through several different cost containment programs, such as Drug Formularies, Maximum Allowable Cost (MAC) Drug Reimbursement Regulations, and Drug Utilization Review programs. Cone and Dranove (1986) and Moore and Newman (1993) have shown that the economic theory of regulation, developed by Gary S. Becker and George J. Stigler, plays a important role in the enactment of these policies across states. One hypothesis of this research is that special interest groups play a significant role in determining the level of reimbursement of the dispensing and ingredient costs of drugs

covered by the Medicaid program. The level of reimbursement for pharmaceutical drugs under Medicaid is particularly important to special interest groups considering that other third party payers may base their payment policies on those of their own states. In addition to special interest variables, the model includes variables representing the public's interest and variables accounting for structural differences between states' pharmaceutical industries and economies.

Pertaining to prescription drug reimbursement levels three endogenous variables will be investigated: (1) dispensing fees, (2) the percentage markup on ingredient costs, and (3) the sum of these two components. The state dispensing fee and the percentage markup both represent sources of profit to pharmacists. The sum of these components provides an estimate of total profits received by pharmacists for prescription drugs covered under Medicaid. Notice that this estimate exaggerates profits since it includes dispensing costs. However, dispensing costs constitute a reasonably fixed percentage of the fee and should, therefore, not affect the observed variation which this paper attempts to explain. The second section of this paper consists of a discussion of the dependent and explanatory variables included in these equations.

Next, the dispensing fees and percentage markup will be considered in the framework of a larger model designed to explain the variation in states' Medicaid prescription drug expenditures. An additional endogenous variable included in the model is the number of Medicaid recipients in the state. The state Medicaid prescription drug expenditure model and the state Medicaid recipients model will be discussed in section three. Section four contains a description of the data and the methods used for estimation. Section five discusses the results.

SECTION II.II: THE DISPENSING FEE AND PERCENTAGE MARKUP

The Dispensing Fee

The dispensing fee covers pharmacists for expenses incurred only through operations in their drug prescription department, accounting for such activities as labeling, filling, and drug counseling; additionally, the dispensing fee includes a net profit.

$$\text{Dispensing fee} = (\text{Cost of dispensing}) + \pi \qquad (2.1)$$

Medicaid reimbursement of dispensing fees can be based on either a fixed fee or variable fee structure. The fixed fee method, used by the majority of states, provides an identical dispensing fee to all participating pharmacists (Table 2.1). Disadvantages of this method include overpayment to pharmacists who have a low per-unit dispensing cost, or underpayment to pharmacists who have relatively high costs regardless of quality and efficiency of services rendered. Furthermore, ignoring efficiency may have adverse effects on cost containment incentives. Finally, this method fails to adjust for differences which are due to, for example geographic locations (rural versus metropolitan.[3]), or type of ownership (chain versus family pharmacists).

Alternatively, some states have adopted a variable fee approach attempting to account for the deficiencies of the fixed fee method (Table 2.1). While this process appears more efficient, it is associated with substantial costs of monitoring and verification of accuracy of the data. Within this approach, one can distinguish between the individual variable fee reimbursement which is based on the costs of operation of individual pharmacists (adjusting for such concepts as overhead cost, location, and

volume), and the categorically variable fees which distinguishes pharmacists according to their location, type of ownership, and type of pharmacy.

Table 2.1 : Dispensing fees for 1994 by state and method.

State	Dispensing fee	State	Dispensing fee
		Rhode Island	3.40
Alabama	$5.40	South Carolina	4.05
Arizona	2.50	South Dakota	4.75
Arkansas	4.51 + .103EAC	Tennessee	3.91
California	4.05	Texas	6.30
Colorado	4.08	Vermont	4.25
Connecticut	4.10	Virginia	4.40
Delaware	3.65	West Virginia	2.75
D.C.	4.50	Wyoming	4.70
Florida	4.23		
Georgia	4.41	Alaska	3.45 - 11.46
Hawaii	4.67	Idaho	4.41 / 5.38
Illinois	3.58	Iowa	4.02 - 6.25
Indiana	4.00	Kansas	3.59 - 4.82
Louisiana	5.77	Kentucky	4.75 - 5.75
Massachusetts	3.00	Maine	3.35 - 5.35
Michigan	3.72	Maryland	4.66 / 7.70
Minnesota	3.85	Montana	2.00 - 4.08
Mississippi	4.91	Nebraska	2.84 - 5.05
Missouri	4.09	New Hampshire	3.25 - 4.15
Nevada	4.64	New Jersey	3.73 - 4.07
New Mexico	4.00	New York	4.50 - 5.50
North Carolina	5.60	Oregon	3.67 - 4.02
North Dakota	4.50	Utah	3.90 - 4.40
Ohio	3.50	Washington	3.65 - 4.50
Oklahoma	5.10	Wisconsin	4.69 - 6.67
Pennsylvania	3.50		

Source : National Pharmaceutical Council. Pharmaceutical Benefits Under State Medical Assistance Programs, 1994 and 1995.

The Ingredient Reimbursement Basis And Percentage Markup

The ingredient reimbursement can be obtained using information regarding the actual acquisition cost (AAC), the average wholesale price (AWP), or the wholesale acquisition cost (WAC). Considering the high cost of acquiring reliable data to calculate the AAC, states have used the latter two methods to estimate acquisition costs as an

alternative. However, neither the AWP nor the WAC represent an accurate or direct measure of actual acquisition costs.

Ordinarily, the AWP is an average representing the suggested wholesale price to the pharmacy, and does not account for discounts which the pharmacist may obtain (for example through large quantity or direct purchases). Considering these discounts, which have been estimated to range from 10 to 18 percent[4], averaging at 16, states customarily deduct an estimated percentage, $\hat{D}_1$, from the AWP to determine the level of reimbursement. On average,

$$AAC = AWP - 16\% \tag{2.2}$$

The remaining difference between the rate at which states reimburse pharmacists and the AAC represents a second source of profits for the pharmacist and is called the percentage markup in this paper. The percentage markup associated with this method, is calculated as

$$\%MARKUP = 16\% - \hat{D}_1 \tag{2.3}$$

For example, referring to Table 2.2, for Alaska, $\hat{D}_1 = 5\%$, implying an estimated percentage markup of 11%.

On the other hand, for states which use the WAC measure the percentage markup is calculated as follows. Wholesalers generally add an estimated 3.39 percent to the wholesale acquisition cost to derive the price of prescription drugs which they charge to pharmacists. Thus, to pharmacists

$$AAC = WAC + 3.39\%. \tag{2.4}$$

Table 2.2: States and methods used to obtain the Ingredient Reimbursement Basis in 1994

Alabama	WAC+9.2%	Montana	AWP - 10%
Alaska	AWP - 5%	Nebraska	AWP-8.71% /WAC+12.52%
Arizona	EAC	Nevada	AWP - 10%
Arkansas	AWP - 10.5%	New Hampshire	AWP - 10%
California	AWP - 5%	New Jersey	AWP - 0/6%
Colorado	AWP - 10 / WAC + 18%	New Mexico	AWP - 10.5%
Connecticut	AWP - 8%	New York	AWP
Delaware	AAC (=AWP)	North Carolina	AWP - 10%
D.C.	AWP - 10%	North Dakota	AWP - 10%
Florida	WAC + 7%	Ohio	AWP - 7%
Georgia	AWP - 10%	Oklahoma	AWP - 10.5%
Hawaii	AWP - 10.5%	Oregon	AWP - 11%
Idaho	AWP	Pennsylvania	AWP
Illinois	AWP - 10%	Rhode Island	AWP
Indiana	AWP - 10%	South Carolina	AWP - 9.5%
Iowa	AWP - 10%	South Dakota	AWP - 10.5%
Kansas	AWP - 10%	Tennessee	
Kentucky	AWP - 10%	Texas	AWP - 10.49%/WAC+12%
Louisiana	AWP - 10.5%	Utah	AWP - 12%
Maine	EAC/AWP - 5%	Vermont	AWP - 10%
Maryland	WAC + 10%	Virginia	AWP - 9%
Massachusetts	WAC + 10%	Washington	AWP - 11%
Michigan	AWP - 10% / AAC	West Virginia	AWP
Minnesota	AWP – 7.6%	Wisconsin	AWP - 10%
Mississippi	AWP – 10%	Wyoming	AWP - 4%
Missouri	AWP – 10.43%		

Source : National Pharmaceutical Council. Pharmaceutical Benefits Under State Medical Assistance Programs, 1995.

Medicaid reimbursement of prescription drugs adds a percentage markup to the *WAC*, say $\hat{M}_1$. Thus, pharmacists get an ingredient reimbursement (IR) equal to

$$IR = WAC + \hat{M}_1 \tag{2.5}$$

Using (2.4) and (2.5), the percentage markup enjoyed by pharmacists under this method, *IR - AAC*, is

$$\%MARKUP = \hat{M}_1 - 3.39\%. \tag{2.6}$$

Accordingly, for Florida (Table 2.2) $\hat{M}_1 = 7\%$, yielding a percentage markup of 3.61%. Table 2.2 contains a list of states and the methods they employed in 1994 to obtain the ingredient reimbursement basis.

Explanatory Variables

Public and special interest variables

There are two opposing theories explaining the enactment of legislation regarding the delivery of medical services, or, within the context of this paper, the reimbursement of pharmaceutical drug expenditures through states' Medicaid policies. The "political" or "public interest" theory assumes that legislation is passed by policy makers based solely on benevolence and altruism directed toward greater equity in the delivery of Medicaid. In contrast, according to the economic theory of regulation, industries or special interest groups acquire or solicit regulation from the state which is designed and operated for their benefit.[5] The ability of an interest group to obtain benefits through legislation is affected by the underlying structure of the interest group, the political process, and the interaction of competing groups both with each other and the legislature. Groups which are more easily organized and whose members are affected more directly and expect to acquire greater gains or losses (ceteris paribus), as a result of legislation, are likely to allocate more resources toward influencing the political process. The benefit or cost to a policy maker of voting for a particular legislation is expressed in terms of political support or loss, through votes, campaign contributions, or volunteer time, from groups whom are affected by that legislation.

Thus, there are two groups of policy related variables which are expected to affect the level of reimbursement of prescription drugs through Medicaid policy. The first group of explanatory variables is associated with the public interest theory of legislation.

1. **The state's budget surplus.** Cone and Dranove (1986) argue that a state's incentive to implement cost containment policies is a product of the political cost of taxation, expressed in terms of the state's relative budget deficit.[6] Budget deficits are expected to have a positive impact on a state's willingness to enact cost containment policies. Similarly, the cost of taxation is expected to have a negative effect on reimbursement of Medicaid drugs; states with low or negative budget surpluses are expected to provide lower reimbursement rates. The state's relative budget surplus is defined as,

$$\text{Relative Budget Surplus} = \frac{\text{state revenue - state expenditures}}{\text{state revenue}}.$$

2. **The state's per recipient Medicaid drug expenditure.** The budgetary burden attributable to the state's Medicaid drug expenditures is also expected to affect reimbursement levels.[7] A higher budgetary burden in the previous year is hypothesized to generate political pressure to limit related expenditures. The first variable considered in this context is the state's per recipient Medicaid drug expenditures from the previous year, calculated as total state Medicaid drug expenditures divided by the number of Medicaid drug recipients in the state, i.e.

$$\text{Per Recipient Drug Expenditures} = \frac{\text{state medicaid drug expenditures}}{\text{state medicaid drug recipients}}.$$

3. **The share of the state's Medicaid budget allocated to prescription drugs.** The next variable measuring the state's budgetary burden related to Medicaid prescription

drug reimbursement is the share of the state's Medicaid budget allocated to prescription drug expenditures in the previous year, defined as

$$\text{Medicaid Drug Share} = \frac{\text{State Medicaid Drug Expenditues}}{\text{State Medicaid Expenditures}}.$$

Pertaining to the economic theory of legislation, the interest groups which are most likely to be affected by state legislation on Medicaid reimbursement of drug expenditures are those related to recipients, pharmacists, physicians, and drug manufacturers.

1. **The number of Medicaid recipients relative to the state's population.** The first of the interest groups considered is the recipient group. The number of overall Medicaid recipients relative to the state's population is used to measure the influence of this group,

$$\text{Medicaid Recipients Relative to Population} = \frac{\text{State Medicaid Recipients}}{\text{State Population}}.$$

Recipients are expected to favor higher reimbursement rates, which may encourage higher numbers of providers to participate in the program, implying better access to covered services. Furthermore, higher reimbursement rates may translate into more time and attention devoted to each recipient.[8] However, the political influence of this group is not expected to be significant. Low income and less educated groups have historically had marginal participation in the voting process. Furthermore, many low income families go through spells of eligibility which last only a few months to a year. Thus, eligibility for Medicaid tends to be transitory, a characteristic which is not very conducive to organization and political recognition of this group.[9]

2. **The American Pharmaceutical Association (APhA).** Higher reimbursements would, by definition, result in a higher net profit per drug for pharmacists. Therefore, the pharmaceutical lobbying group, the American Pharmaceutical Association (APhA), is expected to support higher reimbursement rates. Because of an absence of data on political contributions made by the APhA, the percentage of pharmacists belonging to the APhA, is used to capture the influence of this interest group.
3. **Physician interests.** What about physician interest groups? Unlike drug expenditure containment policies which are aimed, for example, at reducing the range of available drugs, such as formularies, drug reimbursement policies do not affect this group directly. Nonetheless, they are expected to have a preference regarding different cost containment measures; particularly, physicians favor policies which do not affect their freedom to prescribe the most appropriate drug to an individual patient. Physicians are therefore expected to have an incentive to support lower Medicaid drug reimbursement rates over other drug expenditure containment policies. Due to the lack of data on the lobbying activities and political contributions of this group, the number of physicians belonging to the American Medical Association is utilized to capture its influence.[10]
4. **The drug manufacturing industry.** The drug manufacturing industry is affected only indirectly by reimbursement levels. Containment of the Medicaid budget has been on the foreground of the political debate for more than a decade, particularly at the state level. Knowing this, related interest groups will support cost cutting that affects their counterparts, with the goal of protecting their own revenues. Accordingly, this group is expected to support a lower level of reimbursement for

both the dispensing and ingredient costs. The more states save by reducing dispensing fees and the markup, the smaller will be the effort to enact legislation which will adversely affect the drug manufacturing industry. On the other hand, cooperative relationships may exist between this group and pharmacists, creating some ambiguity regarding their motivations and influences.

To measure the drug manufacturing industry's influence its relative concentration as an employer is used. The data used here falls under the Standard Industrial Classification (SIC) industry number 2834, which includes "establishments primarily engaged in manufacturing, fabricating, or processing drugs in pharmaceutical preparations for human or veterinary use. The greater part of the products of these establishments are finished in the form intended for final consumption..."[11] The higher the employment in the drug manufacturing industry the greater its lobbying power. Relative employment in the drug manufacturing industry is calculated as

$$\frac{\text{employment in drug manufacturing}}{\text{state labor force}}.$$

Other explanatory variables

As discussed earlier, pharmacists ordinarily obtain drugs from manufacturers at discounts ranging from 10 to 18 percent. It is reasonable to assume that bigger chain pharmacists with their larger prescription volumes can earn the most discounts through quantity purchases. Furthermore, such chains can achieve economies of scale as a result of their own warehousing operations. These advantages which are inherent of this subset of pharmaceutical companies suggests that the structure of the industry within states may effect Medicaid drug reimbursement legislation. Particularly, states with pharmaceutical

industries consisting of mainly chain pharmacists, each controlling large volumes of prescription drugs, may compensate for the greater discounts with lower ingredient acquisition cost estimates and dispensing fees. To capture the significance of the industry structure, the percentage of chain pharmacists in a state is included in the regression. The percentage of chain pharmacists is calculated as

$$\text{Percentage of Chain Pharmacists} = \frac{\text{number chain pharmacists}}{\text{number of chain} + \text{number of community pharmacists}}.$$

A negative sign is expected for this variable.

Furthermore, the state's per capita personal income is included in the model to proxy the state's willingness and ability to pay for Medicaid services. Higher per capita income (*PCY*) generally provides more resources for state programs and is expected to have a positive effect. Table 2.3 contains a list of variables used in this part of the analysis.

SECTION II.III: STATE MEDICAID RECIPIENTS AND STATE MEDICAID DRUG EXPENDITURES

State Medicaid Recipients

States have traditionally had extensive autonomy in shaping their Medicaid programs.[12] Eligibility requirements for Medicaid assistance, and therefore the number of recipients of Medicaid services, is determined within each state, for example by manipulating income standards, income disregards, resource standards, definitions of disability, or any combination of these factors. The number of Medicaid recipients in the state is therefore considered to be endogenously determined.[13]

Table 2.3: Listing of explanatory variables.

Endogenous variables.
The dispensing fee.
The percentage markup.
The total reimbursement.
Public interest variables
The state's budget surplus, representing the political cost of taxation
The state's per recipient Medicaid drug expenditures
The share of the state's Medicaid budget allocated to drug expenditures
Special interest variables
The number of Medicaid recipients relative to the state's population
The number of pharmacists belonging to the American Pharmaceutical Association
The number of physicians belonging to the American Medical Association
The number of employees in the pharmaceutical drug manufacturing industry relative to the state's labor force.
State and industry structure variables
The percentage of chain pharmacists in the state
Per capita personal income

Median voter variables

Following Moore et al. and Wade et al., a median voter model is employed to explain the variation in the number of Medicaid recipients per state. According to this model taxpayers derive utility from the consumption of goods and services as well as from the transfer of income to welfare recipients. The median voter determines the quantity of public goods by maximizing a utility function subject to a budget constraint:

$$\max_{\{X,W\}} U(X,W,Z) s.t. Y = P_x X + P_w W \qquad (2.7)$$

where X is the quantity of Medicaid services provided and P_x is the tax price to the median voter of an additional unit of service provided. W represents a composite bundle of goods and services, with price P_w, consumed by the median voter, and Z is a set of exogenous factors which influence the median voter's preferences for W or X.

The following variables are employed in the model to proxy the median voter's preferences for providing Medicaid services:

1. **The tax price**. The tax price is approximated by the state's share of Medicaid expenditures, derived by subtracting the Federal Medicaid Assistance Percentage (FMAP), thus

$$Tax\ Price = (1 - FMAP) \tag{2.8}$$

According to this model the quantity of Medicaid services provided and the tax price are inversely related.

2. **Per capita income**. Per capita income is used to measure the median voter's willingness or ability to provide Medicaid services. This variables is expected to have a positive effect on the number of recipients.
3. **Welfare share of the state budget**. The share of the state's budget already devoted to welfare programs is included to proxy the median voter's willingness to provide services to the poor.
4. **Demographic factors**. In addition to the tax price and ability to provide, the existing literature has hypothesized that voters are generally more willing to support children and less willing to help minorities.[14] To control for these factors the percentage of individuals under the age of 21 covered by the AFDC program, and the percentage of the population that is African American are included in the model.

Demand, interest group, and federal policy variables

The number of Medicaid recipients also depends on the current economic environment, the activities of interest groups, and federal policies. To control for these factors the following variables are included in the model.

1. **Demand variables** include the percentage of the population under the poverty line, the unemployment rate, and the relative benefits received by recipients. The relative benefits received by individuals is approximated by the average payments to AFDC families. A positive relationship is expected between these variables and the number of Medicaid recipients.
2. **Interest groups** whose activities are hypothesized to affect the size of the Medicaid population are the hospital and physician groups. The influence of these groups will be approximated by the number of hospital beds per capita and the percentage of physicians belonging to the American Medical Association.
3. **Federal policy** variables include a dummy variable indicating years greater than 1986. The Omnibus Budget Reconciliation Act (OBRA) of 1986 mandated the expansion of Medicaid eligibility to include low-income infants, children, and pregnant women.[15] A second dummy variable is included for years greater than 1990 to take the effects of OBRA 1990 into account. New legislation due to OBRA 1990 include:
    - a mandate that all states adopt retrospective and prospective DUR programs by 1993.
    - prohibition of drug formularies
    - requirement of drug manufacturer's discounts or rebates.
    - prohibition of reductions in pharmacy payments for a 3 year period.
4. **State dummies** are included in this equation to account for the idiosyncrasies of the states. At this first level of state control over the size of the program there are likely to be substantial unobservable characteristics which may have an impact on

legislation. After the eligible population has been established the program takes on the form of an entitlement, at which point the logistics of the Medicaid program itself will largely determine, for example, expenditure levels, while these state unique characteristics assume diminished importance. These state dummies will therefore not be included in the expenditure equations.

State Medicaid Drug Expenditures

Sections II and III discussed the variation in reimbursement levels of prescription drugs covered under the Medicaid program and the variation in the number of Medicaid recipients across states. Dispensing fees, the percentage markup, and the number of Medicaid recipients are all expected to affect expenditure directly.

In addition to the level of reimbursement and eligibility criteria, states have substantial flexibility in determining which services will be covered, the extent to which those services will be covered, and what methods of payment will be used.

Drug expenditure control policy variables

To reduce the growth of Medicaid drug expenditures states have adopted a variety of measures, including:

1. **Restricted formularies** to limit the number of drugs which will be covered by the Medicaid program. Following the analysis of Moore and Newman, the effect of restricted formularies is accounted for through a dummy variable.[16]
2. **Retrospective drug utilization review** programs designed to enhance the quality of care by eliminating unnecessary and inappropriate drug therapy.[17]
3. **Drug-copayments** which are meant to help finance the costs and reduce over-utilization of prescription drugs.[18]

Non-drug control policy variables

When the coverage of a particular service becomes restricted due to legislative action, a needy recipient will attempt to replace it with alternatives which are covered under Medicaid. Medicaid recipients by definition have limited disposable income and will, therefore, seek out the lowest cost care, i.e. the type of care that is most fully covered by the program. For example, if coverage of effective prescription drugs is restricted a patient requiring care may substitute less effective drugs or even alternative sources of medical care, such as physician, outpatient clinic, or even emergency room services. This implies that a decrease in expenditures caused by restrictions in the coverage of that service may have spill over effects into substitute services, causing increases in related expenditures.[19, 20]

On the other hand, some services serve as complements to others. A patient acquires prescription drugs through a two step process. The patient first initiates contact with a physician who then prescribes the prescription drug if deemed necessary. In this sense physician care and prescription drugs are complements, implying a positive relationship between physician services and prescription drugs.[21, 22]

To control for these substitute and complementary relationships a number of non-drug control policy variables are included in the prescription drug expenditure equation. Policies which are aimed at restricting the use of non-drug services may increase or decrease prescription drug expenditures depending on whether they are substitutes or complements. The following non-drug policy dummy variables, with a value of one if the policy is in use, are included: the state

1. has limits on the coverage of inpatient hospital services.
2. uses Medicare principles, or prospective payment, for the reimbursement of inpatient hospital services.
3. has limits on the coverage of outpatient hospital services.
4. uses Medicare principles, or prospective payment, for the reimbursement of outpatient hospital services.
5. has limits on the coverage of skilled nursing facility services.
6. has limits on mentally retarded intermediate care facility services.
7. has limits on physicians' inpatient hospital visits.
8. requires prior authorization for certain physician services.
9. uses Medicare principles to reimburse physician services.

In addition to these nine dummy variables the model also includes real co-payment (deflated using the all-item CPI) on physician services.

Recipient and state characteristics

Not all age groups have the same demand for health services.

1. **The percentage of recipients under age 21.** Younger populations ordinarily enjoy greater health status, therefore requiring fewer services.
2. **The percentage of recipients age 65 and above.** In contrast, older populations generally have a higher demand for such services, including prescription drugs. Furthermore, since long-term care and prescription drugs are not covered under Medicare the percentage of the population over 65 years of age is expected to have a significant impact on Medicaid prescription drug expenditures. Payments per user for the aged were $668 compared to $69 and $148 for children and adults, respectively.[23]

State characteristic variables included are the percentage of the population living in metropolitan areas, per capita pharmacists, and per capita physicians.

1. **The percentage of people living in metropolitan areas** is included to account for any variation that is due to difference in their demand relative to their non-metropolitan counterparts.
2. **Per capita pharmacists and physicians** are included to capture the effects of greater supply of, and access to, medical services.

Federal policy variables

The role of the federal government in the Medicaid program has been to establish and regulate a minimum level of benefits. Pertaining to this there have been two major policy changes during the study period.

1. **The Omnibus Reconciliation Act** (OBRA) of 1987 which, among other legislation, expanded Medicaid eligibility.
2. **OBRA** of 1990 which prohibited the use of drug formularies, required drug manufacturers' discounts or rebates, and prohibited reductions in pharmacy payments for a three year period.[24]
3. Trend variables to account for year to year changes in Medicaid program logistics, stemming, for example, from new legislation.

Table 2.4 : Growth rates of recipients of prescription drugs under Medicaid.

AL	1.32	-9.04	7.64	4.41	***1.08***	7.12	15.51	20.02	12.69	3.53	***11.77***
AR	5.95	-0.43	3.98	7.28	***4.20***	8.44	7.85	11.59	5.43	0.23	***6.71***
CA	5.79	4.86	3.34	-3.23	***2.69***	8.9	12.31	11.01	7.85	5.5	***9.11***
CO	-1.4	11.59	6.18	6.83	***5.80***	6.75	18.14	18.62	9.58	2.02	***11.02***
CT	-0.66	-0.95	-0.72	3.28	***0.24***	15.93	9.96	12.84	6.82	6.48	***10.41***
DE	-3.07	-5.24	-3.22	5.45	***-1.52***	4.79	31.38	14.22	13.01	10.79	***14.84***

Source: Health Care Financing Administration, Form 2082. (Table Con'd.)

Table 2.4: Continued

FL	4.64	7.03	11.32	10.64	***8.41***	23.23	17.53	30.08	15.02	-4.35	***16.30***
GA	33.58	5.38	2.42	8.22	***12.40***	12.92	16.37	18.97	8.82	9.22	***13.26***
HI	-2.26	-1.75	0.62	5.15	***0.44***	-4.66	8.24	9.36	11.27	10.15	***6.87***
IA	7.39	4.22	-1.6	-1.2	***2.20***	9.36	9.56	5.64	2.59	7.95	***7.02***
ID	-6.54	7.19	18.78	4.1	***5.88***	13.94	28.89	24.23	14.9	12.06	***18.80***
IL	5.1	-0.55	-1.61	2.08	***1.26***	2.39	7.57	11.72	5.83	-0.55	***5.39***
IN	10.58	0.28	2.15	-1.13	***2.97***	11.02	21.23	23.03	10.46	9.13	***14.97***
KS	-11.8	10.07	23.03	5.68	***6.75***	9.29	11.04	10.69	8.9	4.47	***8.88***
KY	4.16	-1.23	1.67	5.2	***2.45***	10.03	17.86	12.59	5.47	2.27	***9.64***
LA	7.7	5.64	-10.31	20.73	***5.94***	14.3	11.69	10.39	6.16	4.54	***9.42***
MA	2.36	6.13	0.9	3.39	***3.20***	1.41	12.09	7.8	2.78	2.81	***5.38***
MD	-0.82	-3.43	-1.67	2.61	***-0.83***	3.96	7.73	10.19	11.67	-4.14	***5.88***
ME	1.96	-0.25	-0.46	3.37	***1.16***	8.73	15.49	5.93	3.11	5.79	***7.81***
MI	1.58	-0.42	-0.03	2.36	***0.87***	2.09	7.22	1.25	-10.28	16	***3.26***
MN	1.14	-4.93	-2.28	-3.91	***-2.50***	25.14	4.06	1.3	5.48	-1.26	***6.94***
MO	6.29	2.44	4.3	6.7	***4.93***	0.22	26.6	14.23	13.01	9.98	***12.81***
MS*	5.56	7.75	5.13	7.25	***6.42***	7.68	8.32	11.17	3.26	0.66	***6.22***
MT	13.06	9.7	31.03	-14.55	***9.81***	0.58	4.1	-7.3	50.96	8.21	***11.31***
NC	9.3	2.98	7.09	15.69	***8.77***	12.68	22.09	18.83	13.4	5.1	***14.42***
ND	10.1	9.76	5.91	5.71	***7.87***	6.61	6.53	11.39	7.48	0.84	***6.57***
NE	8.94	5.87	-0.18	3.74	***4.59***	10.07	14.44	15.36	8.2	0.2	***9.65***
NH	-1.04	-3.31	-0.23	9.33	***1.19***	20.55	32.18	21.69	14.73	13.67	***20.56***
NJ	-0.99	9.46	-15.24	0.74	***-1.51***	5.97	8.82	10.41	8.43	0.81	***6.89***
NM	5.26	6.66	8.76	5.9	***6.65***	12.99	26.01	18.4	13.34	10.5	***16.25***
NV	11.49	5.44	6.58	14.23	***9.44***	17.56	26.17	27.16	8.52	2.04	***16.29***
NY	20.6	-1.4	-3.3	0.15	***4.01***	4.42	7.13	4.45	4.86	2.31	***4.63***
OH	3.03	1.1	-2.92	3.34	***1.14***	1.95	12	11.56	3.3	-0.65	***5.63***
OK	-10.39	34.98	2.66	6.83	***8.52***	10.81	15.11	20.65	10.54	-1.59	***11.10***
OR	3.75	3.46	7.64	14.37	***7.31***	7.23	-0.1	34.58	7.96	6.77	***11.29***
PA	1.98	-6.89	-2.03	6.1	***-0.21***	6.26	12.18	10.05	0.12	5.14	***6.75***
RI*	-2.56	-0.07	0.56	4.81	***0.69***	14.89	16.31	7.56	18.83	-55.6	***0.40***
SC	9.23	1.58	-2.35	5.21	***3.42***	14.49	22.57	16.11	8.8	4.1	***13.21***
SD	6.99	14.85	4.44	8.3	***8.65***	9.16	17.03	15.06	6.97	6.53	***10.95***
TN*	5.93	15.11	9.49	13.35	***10.97***	12.39	15.19	14.16	15.23	-35.2	***4.35***
TX	13.19	11.51	7.57	10.72	***10.75***	20.49	21.71	20.72	14.17	7.93	***17.00***
UT	7.82	9.53	7	8.36	***8.18***	15.14	17.78	16.35	8.73	7.67	***13.13***
VA	3.53	0.54	2.04	7.2	***3.33***	8.52	17.62	17.81	12.53	9.38	***13.17***
VT	0.22	2.29	3.87	5.43	***2.95***	11.9	16.84	9.17	6.57	17.28	***12.35***
WA	10.47	10.34	4.33	7.23	***8.09***	8.61	14.25	12.95	10.37	2.21	***9.68***
WI	-8.71	2.13	0.38	-2.17	***-2.09***	3.1	5.58	5.87	7.01	0.47	***4.41***
WV	8.12	6.37	2.09	13.7	***7.57***	2.24	18.64	11.04	10.08	4.78	***9.36***
U.S.*	5.93	2.84	1.15	5.60	***5.41***	7.96	11.55	10.52	7.22	4.62	***8.05***

SECTION II.IV: DATA AND ESTIMATION METHODS

Data was collected for 47 states (see Table 2.1) covering a period of 10 years from 1985 to 1994, adding up to a total of 470 observations. Social-economic data was obtained from the Statistical Abstract of the United States. Medicaid prescription drug policy specific data was compiled from the Pharmaceutical Benefits Under State Medical Assistance Programs publication by the National Pharmaceutical council. Additional Medicaid specific statistics were acquired from publications of the Health Care Financing Administration (HCFA), including the internet site www.hcfa.gov.com. Other data sources include the County Business Patterns, and data collected by Professor Moore.[25]. The unit of analysis is the State. Missing observations for APhA membership and AMA membership were extrapolated using averages from previous and following years.

Structural Breaks in the Data

Since its creation, the Medicaid program, and in particular cost containment, has been subject to ongoing changes in the legislative process. Not surprisingly, F-tests for structural breaks revealed that the parameter vector is not the same throughout the sample period.[26] Consequently, the data had to be divided into two five year segments. Subsequent F-tests indicate that the data can be grouped into two five year blocks, ranging from 1985-1989 and 1990-1994.

The break in the parameter vector coincides with extensive activity in the political arena, regarding the Medicaid program. OBRA 1987 and 1989, for example mandated eligibility expansions to include pregnant women and children up to age six with incomes below 133 of the federal poverty level. The growth rates of prescription drug recipients are shown in Table 2.4. With the exception of Mississippi, Rhode Island, and Tennessee,

all states experienced a substantial increase in the growth of prescription drug recipients. Rhode Island and Tennessee also had higher growth rates from 1989 - 1993, but experienced a substantial drop between 1993 and 1994.

As discussed earlier, OBRA 1990 also included several new legislative measures relating to prescription drug coverage under Medicaid. Furthermore, there is a noticeable increase in the number of states adopting ingredient markup adjustment policies between 1989 and 1990, perhaps in anticipation of OBRA 1990. Table 2.5 lists the years during which the 47 states included in the sample adopted such adjustment measures, indicating that the number of states using such measures increased dramatically from 20 (43 percent) to 39 (83 percent) in 1990.

Table 2.5 : Years in which states in the sample made adjustments in the ingredient reimbursement basis.

State											Percent
Alabama	.	.	Y	Y	Y	Y	Y	Y	Y	Y	87
Arkansas	.	.	.	.	.	Y	Y	Y	Y	Y	90
California	.	.	.	.	.	Y	Y	Y	Y	Y	90
Colorado	.	.	.	.	.	Y	Y	Y	Y	Y	90
Connecticut	.	.	.	.	Y	Y	Y	Y	Y	Y	89
Delaware	.	.	.	.	.	Y	Y	Y	.	.	90
Florida	.	.	Y	Y	Y	Y	Y	Y	Y	Y	87
Georgia	.	.	.	.	Y	Y	Y	Y	Y	Y	89
Hawaii	.	.	.	.	Y	Y	Y	Y	Y	Y	89
Idaho	.	.	.	.	.	.	.	.	.	.	
Illinois	.	.	.	Y	Y	Y	Y	Y	Y	Y	88
Indiana	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	85
Iowa	.	.	Y	Y*	Y	Y	Y	Y	Y	Y	87
Kansas	.	.	.	.	.	Y	Y	Y	Y	Y	90
Kentucky	.	.	.	.	.	Y	Y	Y	Y	Y	90
Louisiana	.	.	.		Y	Y	Y	Y	Y	Y	89
Maine	Y	Y	Y	Y*	.	Y	Y	Y	Y	Y	85
Maryland	.	.	.	.	.	Y	Y	Y	Y	Y	90
Massachusetts	.	.	.	.	Y	Y	Y	Y	Y	Y	89
Michigan	.	.	.	Y*	.	Y	Y	Y	Y	Y	88
Minnesota	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	85

Source : Pharmaceutical Benefits Under State Medical Assistance Programs. *States which made adjustments on selected drugs only. (Table Con'd.)

Table 2.5: Continued

Mississippi	.	.	.	.	.	Y	Y	Y	Y	Y	90
Missouri	.	.	.	.	.	.	Y	Y	Y	Y	91
Montana	.	.	.	Y*	Y	Y	Y	Y	Y	Y	88
Nebraska	.	.	.	Y*	Y	Y	Y	Y	Y	Y	88
Nevada	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	85
New Hampshire	.	.	.	.	.	Y	Y	Y	Y	Y	90
New Jersey	Y	Y	Y*	Y*	.	Y	Y	Y	Y	Y	80
New Mexico	.	.	.	.	Y	Y	Y	Y	Y	Y	89
New York	.	.	.	.	.	.	.	.	.	Y	94
North Carolina	.	.	.	.	.	Y	Y	Y	Y	Y	90
North Dakota	.	.	.	.	.	.	Y	Y	Y	Y	91
Ohio	Y	Y	Y	.	.	Y	Y	Y	Y	.	85
Oklahoma	.	.	.	.	.	Y	Y	Y	Y	Y	90
Oregon	.	.	.	.	.	Y	Y	Y	Y	Y	90
Pennsylvania	.	.	.	.	.	.	.	.	.	.	
Rhode Island	.	.	.	.	.	.	.	.	.	Y	94
South Carolina	Y	Y	Y	Y*	Y	Y	Y	Y	Y	Y	85
South Dakota	.	Y	Y	Y*	Y	Y	Y	Y	Y	Y	86
Tennessee	.	.	.	Y	Y	Y	Y	Y	.	.	88
Texas	.	.	Y*	Y*	Y*	Y	Y	Y	Y	Y	87
Utah	.	.	Y	Y*	Y	Y	Y	Y	Y	Y	87
Vermont	.	.	.	.	.	Y	Y	Y	Y	Y	90
Virginia	.	.	.	.	.	.	Y	Y	Y	Y	91
Washington	Y	Y	Y	Y	.	Y	Y	Y	Y	Y	85
West Virginia	.	.	.	.	.	.	.	.	.	.	
Wisconsin	.	.	.	.	.	Y	Y	Y	Y	Y	90
Total	***8***	***9***	***14***	***18***	***20***	***39***	***42***	***42***	***40***	***41***	

Source : Pharmaceutical Benefits Under State Medical Assistance Programs.

Table 2.6: Independent variables employed.

	Category	Abbreviation
1.	Public policy	*PP*
2.	Interest group	*IG*
3.	State characteristics	*SC*
4.	Median voter	*MV*
5.	Demand	*D*
6.	Federal policy	*FP*
7.	Recipient Characteristics	*RC*
8.	Drug expenditure control	*DC*
9.	Non drug control policy	*NDC*

Estimation Procedures

There are five endogenous variables for each five year period, the dispensing fee, the percentage markup, the estimated total profit, the number of Medicaid recipients, and prescription drug expenditures. The independent variables may be grouped into nine categories (Table 2.6).

The dispensing fee, percentage markup, Medicaid recipients, and drug expenditure equations were estimated using a simultaneous equations iterative three stage least squares (3SLS) approach. The model estimated for each five year period is as follows:

$$\left[\begin{array}{l} y_1 = \beta_{01} + \sum_{t=1}^{3} PP \cdot \beta_{t1} + \sum_{t=4}^{7} IG \cdot \beta_{t1} + \sum_{t=8}^{9} SC \cdot \beta_{t1} + \varepsilon_1 \\ y_2 = \beta_{02} + \sum_{t=1}^{3} PP \cdot \beta_{t2} + \sum_{t=4}^{7} IG \cdot \beta_{t2} + \sum_{t=8}^{9} SC \cdot \beta_{t2} + \varepsilon_2 \\ y_3 = \beta_{03} + \sum_{t=1}^{5} MV \cdot \beta_{t3} + \sum_{t=6}^{8} D \cdot \beta_{t3} + \sum_{t=9}^{10} IG \cdot \beta_{t3} + \sum_{t=11}^{12} IG \cdot \beta_{t3} + \varepsilon_3 \\ y_4 = y_1\gamma_{14} + y_2\gamma_{24} + y_3\gamma_{34} + \sum_{t=1}^{3} DC \cdot \beta_{t4} + \sum_{t=4}^{5} RC \cdot \beta_{t4} + \sum_{t=6}^{16} NDC \cdot \beta_{t4} + \sum_{t171}^{18} FP \cdot \beta_{t4} + \varepsilon_5 \end{array}\right] \quad (2.9)$$

Where y_1 is the dispensing fee, y_2 is the percentage markup, y_3 is the number of Medicaid recipients, and y_4 is the natural logarithm of pharmaceutical drug expenditures. The 3SLS approach accounts for the information that may be embedded in the error covariances $E[\varepsilon_i \varepsilon_j'] = \sigma_{ij} I$ for $i \neq j$, between the i[th] and j[th] equations.[27] Since the dependent variables in the model are determined within the same system, it is reasonable to assume nonzero "contemporaneous" covariances between the equations' disturbance terms. Furthermore,

since the equations are over-identified, 3SLS will increase the efficiency of the estimation.

To test whether this more technical estimation method produced more efficient estimates, hypothesis tests were conducted of the form

$$H_0 : \sigma_{ij} = 0 \quad \text{vs.}$$
$$H_1 : \text{at least one } \sigma_{ij} \neq 0.$$

Lagrange Multiplier (LM) tests were executed both jointly and individually to test whether the covariances between equations were significantly different from zero. The LM statistic has a $\chi^2_{(p)}$ distribution under the null-hypothesis, where (p) represents the number of hypotheses being tested. The joint hypothesis test yielded a value of 31.466, testing the hypothesis, $H_0 : \sigma_{12} = 0; \sigma_{13} = 0; \sigma_{14} = 0; \sigma_{23} = 0; \sigma_{24} = 0; \sigma_{34} = 0$ against the alternative that at least one covariance is non-zero in the first period. The subscripts represent, respectively, the prescription drug expenditure, dispensing fee, percentage markup, and Medicaid recipients equations. The critical value of a chi-square distribution with six degrees of freedom at the $(\alpha = 0.01)$ level is 16.81. The null-hypothesis is therefore rejected in favor of the alternative. This result holds for the second period as well. An individual hypothesis of particular interest examined the covariance of the residuals of the dispensing fee and percentage markup equations, $H_0 : \sigma_{23} = 0$. The LM test again led to the rejection of the null-hypothesis in favor of the alternative in both periods of the analysis. These results indicate substantial gains in efficiency of the 3SLS method over OLS pertaining to the data used in this study.

Furthermore, there exists adequate evidence in the existing literature that the level of dispensing fees and the percentage markup are systematically related.[28] States which reimburse the dispensing fee at high rates tend to support lower percentage markups on ingredient costs, perhaps to achieve a balance. The simple correlation coefficient between these two variables is (-0.52686) and statistically significant at the $(\alpha = 0.01)$ level. Given the above discussed reasons, the reimbursement levels for dispensing fees and the percentage markup are assumed to be jointly determined. Simultaneous equations estimation should therefore yield superior results over a single equations approach.

In a separate model the sum of the dispensing fee (as a percentage) and the percentage markup, calculated as

$$SUM = \frac{\text{Dispensing fee}}{\text{Average drug price}} + \text{Percentage markup} \tag{2.10}$$

is considered. Two equations are estimated here using an iterative seemingly unrelated regressions model:

$$\begin{bmatrix} SUM_{85-89} = \beta_{01} + \sum_{i=1}^{3} PP \cdot \beta_{i1} + \sum_{i=4}^{7} IG \cdot \beta_{i1} + \sum_{i=8}^{9} SC \cdot \beta_{i1} + \varepsilon_1 \\ SUM_{90-95} = \beta_{02} + \sum_{i=1}^{3} PP \cdot \beta_{i2} + \sum_{i=4}^{7} IG \cdot \beta_{i2} + \sum_{i=8}^{9} SC \cdot \beta_{i2} + \varepsilon_2 \end{bmatrix} \tag{2.11}$$

Before proceeding with the estimation the equations were also examined for heteroskedasticity and autocorrelation. The diagnostics revealed that the former problem is present in the data. The variances appear to be related to the size of the health care market in the states. To account for this each equation in the system is first corrected using the multiplicative heteroskedasticity model.[29] Subsequent diagnostics, examining

the 2SLS residuals, were used to verify that the problem had been removed. A comparison of the 3SLS results from this analysis and OLS results indicate that the latter method may either underestimate or overestimate the significance of certain factors.

SECTION II.V: EMPIRICAL RESULTS

The Dispensing Fee, Percentage Markup, And Total Profit Equations

The results for the 1985-1989 and 1990-1994 periods are shown in Tables 1.7 (a-c) and 1.8 (a-c), respectively.

Public interest variables

The estimated coefficients associated with the public interest variables are generally statistically insignificant and do not carry consistent signs. In this analysis, no evidence was found to support the hypothesis that the states' political cost of taxation determines the reimbursement levels of dispensing fees and ingredient component markups of pharmacists' production.

1. The state's relative budget surplus has a positive and significant impact on total profit during the 1985-1989 period, but is not significant in all other equations.
2. Per recipient Medicaid drug expenditures of the previous year is not statistically significant in the total profit equation of the first period. Also, contrary to expectations, the estimated coefficients for the component equations indicate a positive relationship. For the second period the estimated coefficients are all negative in the dispensing fee and total profit equations as predicted. This may be an indication of mounting pressures to contain prescription drug expenditures over time.
3. The share of the state's Medicaid budget allocated to prescription drugs in the previous period also does not perform well. Contrary to expectation the impact of

this variable appears to be positive and significant in the dispensing fee equations. In the percentage markup equations it does carry a negative sign but is significant only in the second period.

The special interest variables

The special interest variables perform better and have significantly more explanatory power. With the exception of the Medicaid recipients, the special interest groups generally have a statistically significant influence on the three dependent variables.

1. Medicaid recipients as a percentage of the state population has a positive and significant impact on the percentage markup in both periods of the analysis. However, contrary to expectation the impact of this variable is negative and significant in the dispensing fee equations of both periods. The impact on total profit is not statistically significant. This lack of consistency and significance may be due to the limited political power and organization that is inherent to this group.
2. The percentage of pharmacists who are members of the APhA was expected to have a positive impact on reimbursement levels. Accordingly, a strong positive and statistically significant impact is observed in both the component equations as well as in the total profit equations. These results suggest that the APhA has been successful in protecting their members' interests.
3. The percentage of physicians belonging to the AMA has the expected negative impact particularly in the second period. An anomalous positive and significant coefficient was found for the dispensing fee equation in the first period.

4. The percentage of the labor force employed by the drug manufacturing industry does not have a consistent impact. In the first period it is not significant in any of the equations. In contrast, in the second period it has a positive and significant impact on the percentage markup component.

Other explanatory variables

1. The percentage of chain pharmacists in the state has a consistent, predicted, negative, and generally statistically significant influence on all three dependent variables. This indicates that states have been successful in accounting for the lower average cost enjoyed by chain pharmacists. The only deviation from this pattern was observed in the percentage markup equations where the impact was not significant at the ($\alpha = 0.05$) level.

2. The states' per capita income was predicted to have a positive impact on the willingness and ability to support higher reimbursement rates. Larger per capita income presumably implies increased ability and willingness to support higher payment levels. The results obtained here do not confirm this hypothesis. An explanation for this may lie in the structure of the Medicaid program which is a joint federal-state contract.[30] The states' share of incurred expenditures is calculated as

$$StateShare = \left[\frac{\text{State Per Capita Personal Income}}{\text{National Per Capita Personal Income}}\right]^2 \times 0.45. \qquad (2.12)$$

A state's share of expenditures is thus directly related to its per capita income. Therefore, states with a higher per capita income pay a larger share of the incurred expenditures and thus have an incentive to limit reimbursement levels.

Table 2.7a: Three stage least squares parameter estimates. Dependent variable: Dispensing Fee (1985-1989).

Variable	Estimate	Standard Error	t-Value	Pr > |t|
Constant	**2.4852**	**0.2557**	**9.72**	**0.0001**
Relative budget surplus	0.2809	0.3688	0.76	0.4471
Per recipient drug expenditures	**0.0018**	**0.0009**	**2.06**	**0.0410**
Drug share of Medicaid	**4.5943**	**1.4840**	**3.10**	**0.0022**
Medicaid recipients/population	**-0.0049**	**0.0011**	**-4.48**	**0.0001**
Percentage APhA membership	**0.0072**	**0.0023**	**3.13**	**0.0020**
Percentage AMA membership	**0.0040**	**0.0018**	**2.26**	**0.0249**
Drug manufacturing employ.	-0.0341	0.0207	-1.65	0.1010
Percentage chain pharmacists	**-0.0103**	**0.0024**	**-4.27**	**0.0001**
Per capita income	0.0000	0.0000	1.73	0.0856

Estimates significant at the five percent level are in boldfaced print.

Table 2.7b: Three stage least squares parameter estimates. Dependent variable: Percentage Markup (1985-1989).

Variable	Estimate	Standard Error	t-Value	Pr > |t|
Constant	**16.5551**	**3.1308**	**5.29**	**0.0001**
Relative budget surplus	-0.1817	4.4044	-0.04	0.9671
Per recipient drug expenditures	**0.0241**	**0.0089**	**2.7**	**0.0075**
Drug share of Medicaid	-24.5267	15.4918	-1.58	0.1148
Medicaid recipients/population	**0.0279**	**0.0129**	**2.16**	**0.0322**
Percentage APhA membership	**0.0835**	**0.0294**	**2.84**	**0.0049**
Percentage AMA membership	**-0.0468**	**0.0210**	**-2.23**	**0.0268**
Drug manufacturing employm.	-0.0977	0.1258	-0.78	0.4383
Percentage chain pharmacists	-0.0205	0.0228	-0.9	0.3692
Per capita income	**-0.0005**	**0.0001**	**-4.1**	**0.0001**

Estimates significant at the five percent level are in boldfaced print.

Table 2.7c: Three stage least squares parameter estimates. Dependent variable: Total profit (1985-1989).

Variable	Estimate	Standard Error	t-Value	Pr > |t|
Constant	**46.7106**	**3.6414**	**12.83**	**0.0001**
Relative budget surplus	**12.8366**	**4.9559**	**2.59**	**0.0102**
Per recipient drug expenditures	0.0175	0.0119	1.48	0.1412
Drug share of Medicaid	3.8430	19.9507	0.19	0.8474
Medicaid recipients / population	-0.0065	0.0151	-0.43	0.6685
Percentage APhA membership	**0.1966**	**0.0324**	**6.07**	**0.0001**
Percentage AMA membership	-0.0204	0.0244	-0.84	0.4041
Drug manufacturing employm.	0.2390	0.3380	0.71	0.4802
Percentage chain pharmacists	**-0.1888**	**0.0341**	**-5.54**	**0.0001**
Per capita income	**-0.0007**	**0.0002**	**-3.52**	**0.0005**

Estimates significant at the five percent level are in boldfaced print.

Table 2.8a: Three stage least squares parameter estimates. Dependent variable: Dispensing Fee (1990-1994).

Variable	Estimate	Standard Error	t-value	p-value
Constant	**4.4926**	**0.5675**	**7.92**	**0.0001**
Relative budget surplus	0.4417	0.3776	1.17	0.2432
Per recipient drug expenditures	-0.0013	0.0011	-1.24	0.2174
Drug share of Medicaid	**8.3641**	**1.9044**	**4.39**	**0.0001**
Medicaid recipients / population	**-0.0031**	**0.0012**	**-2.63**	**0.0093**
Percentage APhA membership	**0.0119**	**0.0030**	**4.01**	**0.0001**
Percentage AMA membership	**-0.0066**	**0.0029**	**-2.27**	**0.0240**
Drug manufacturing employm.	-0.0195	0.0190	-1.02	0.3067
Percentage chain pharmacists	**-0.0089**	**0.0024**	**-3.75**	**0.0002**
Per capita income	**-0.0001**	**0.0000**	**-3.4**	**0.0008**

Estimates significant at the five percent level are in boldfaced print.

Table 2.8b: Three stage least squares parameter estimates. Dependent variable: Percentage markup (1990-1994).

Variable	Estimate	Standard Error	t-value	p-value
Constant	**10.4437**	**3.6124**	**2.89**	**0.0042**
Relative budget surplus	-3.3126	2.7890	-1.19	0.2362
Per recipient drug expenditures	0.0082	0.0080	1.03	0.3055
Drug share of Medicaid	**-57.0285**	**12.5459**	**-4.55**	**0.0001**
Medicaid recipients / population	**0.0394**	**0.0077**	**5.09**	**0.0001**
Percentage APhA membership	**0.0491**	**0.0218**	**2.25**	**0.0254**
Percentage AMA membership	**-0.0345**	**0.0176**	**-1.96**	**0.0515**
Drug manufacturing employm.	**0.4477**	**0.1706**	**2.62**	**0.0093**
Percentage chain pharmacists	-0.0315	0.0162	-1.94	0.0537
Per capita income	-0.0002	0.0002	-1.49	0.1377

Estimates significant at the five percent level are in boldfaced print.

Table 2.8c: Three stage least squares parameter estimates. Dependent variable: Total profit (1990-1994).

Variable	Estimate	Standard Error	t-value	p-value
Constant	**49.6113**	**4.6472**	**10.68**	**0.0001**
Relative budget surplus	-0.4658	3.4560	-0.13	0.8929
Per recipient drug expenditures	**-0.0249**	**0.0097**	**-2.58**	**0.0104**
Drug share of Medicaid	12.4967	16.0472	0.78	0.4369
Medicaid recipients / population	-0.0156	0.0101	-1.55	0.1226
Percentage APhA membership	**0.0656**	**0.0281**	**2.34**	**0.0203**
Percentage AMA membership	**-0.0534**	**0.0230**	**-2.32**	**0.0213**
Drug manufacturing employm.	0.3378	0.1894	1.78	0.0758
Percentage chain pharmacists	**-0.0995**	**0.0204**	**-4.87**	**0.0001**
Per capita income	**-0.0008**	**0.0002**	**-4.12**	**0.0001**

Estimates significant at the five percent level are in boldfaced print.

The Medicaid Recipients And Prescription Drug Expenditures Equations

Medicaid recipients

The regression results are summarized below and shown in Tables 2.9a and 2.9b.

1. The median voter variables all carry the expected signs for both time periods, and are mostly statistically significant. Per capita income has a positive and significant impact in both periods; the tax price has a negative coefficient, but is significant only in the second period; the welfare share of the budget, reflecting the median voter's tastes for providing service to the poor is positive and significant in the first period; the percentage of individuals under the age of 21 has a positive influence and is significant in the second period; and, the percentage of African Americans has a negative and significant impact in the first period.
2. The demand control variables do not perform as well. The number of individuals under the federal poverty level has a significant and positive impact in both periods as expected. The unemployment rate has a negative estimated coefficient in the first period, but becomes positive and insignificant in the second. Relative benefits also do not follow the expected behavior.
3. The interest group variables also show mixed results. The per capita hospital beds variable, used as a proxy for the hospital industry's influence, has a positive impact. The coefficient is significant in the first period. The percentage of physicians belonging to the AMA is significant in both periods, but changes from having a positive to a negative impact.

4. The policy variables included in the model were a dummy variables representing the impact of OBRA 1987 for the first period, and OBRA 1990 in the second period. The results indicate that neither OBRA 1987 nor OBRA 1990 had a significant impact.

Prescription drug expenditures

The regression results for these equations are discussed below and are shown in Tables 2.10a and 2.10b.

1. The first group of variables consists of the dependent variables of the preceding equations. In the first period the dispensing fee, percentage markup, and number of Medicaid recipients all have a highly significant impact. The percentage markup and the number of Medicaid recipients both have the expected positive impact on drug expenditures. However, the results indicate a negative relationship between the level of dispensing fees and prescription drug expenditures in period one. Diagnostic tests revealed that the dispensing fee exhibited little variation in this period, causing it to be highly collinear with the intercept term, and providing, at least in part, an explanation for this contradictory result. Therefore, more weight is given to the results of the second period, in which the problem appeared to be alleviated to some extent. In the second period the dispensing fee, the percentage markup, and the number of Medicaid recipients are all statistically significant with the expected positive sign.
2. The drug cost containment policy variables do not have a consistent impact. The presence of drug formularies and DUR programs does not have the anticipated effect on drug expenditures in either period. However, states with a larger co-payment amount do have lower drug expenditures in the first period. This variable becomes

insignificant in the later period. The weak performance of drug containment policies may be due to their endogenous nature.[31] Perhaps a more fully specified model, including equations explaining the enactment of these policies, would produce more agreeable results.

3. The state characteristics also have mixed influences. The percentage of the population over the age of 65 has a positive and significant impact in the first period, but is negative and significant in the second. The percentage of AFDC recipients under age 21 is not significant in either period. The percentage of the population living in metropolitan areas changes from negative and significant in the first period to positive and significant in the second.
4. The provider variables perform well: both the per capita pharmacists and per capita physicians variables have a positive impact, although the former is only significant in the second period.
5. The non-drug policy variables fluctuate both in significance and sign between the two periods.

Table 2.9a: Three stage least squares parameter estimates. Recipients (1985-1989).

Variable	Estimate	Standard Error	t-value	Prob>|t|
Constant	**-955764.4600**	**275768.2000**	**-3.47**	**0.0007**
Per capita income	**17.4271**	**3.9242**	**4.44**	**0.0001**
Tax price	-3832.2700	2217.6000	-1.73	0.0857
Welfare share of the budget	**594068.1300**	**132395.6000**	**4.49**	**0.0001**
Percentage AFDC under age 21	729.4720	662.0937	1.1	0.2721
Percentage African American	**-3302.9500**	**1289.6000**	**-2.56**	**0.0113**
Number of people in poverty	**0.1275**	**0.0342**	**3.73**	**0.0003**
Unemployment rate	**-10202.9900**	**2719.6000**	**-3.75**	**0.0002**
Real relative benefits	-83784.6800	289204.2000	-0.29	0.7724
Per capita hospital beds	**31936.5600**	**2127.1000**	**15.01**	**0.0001**
Percentage AMA membership	**1623.8200**	**650.9565**	**2.49**	**0.0135**
OBRA 1987	**15671.1400**	**6395.8000**	**2.45**	**0.0153**

Estimates significant at the five percent level are in boldfaced print.

Table 2.9b: Three stage least squares parameter estimates. Recipients (1990-1994).

Constant	**-991052.7800**	**487164.9000**	**-2.03**	**0.0434**
Per capita income	**43.6286**	**19.3437**	**2.26**	**0.0253**
Tax price	**-8222.0700**	**3224.8000**	**-2.55**	**0.0116**
Welfare share of the budget	181446.8200	227450.6000	0.8	0.4261
Percentage AFDC under age 21	**7228.2300**	**1998.1000**	**3.62**	**0.0004**
Percentage African American	-2943.3300	1881.5000	-1.56	0.1195
Number of people in poverty	**0.6376**	**0.0502**	**12.7**	**0.0001**
Unemployment rate	5722.8300	7024.1000	0.81	0.4163
Real relative benefits	**-1852998.0100**	**606420.7000**	**-3.06**	**0.0026**
Per capita hospital beds	6346.6800	3709.3000	1.71	0.0888
Percentage AMA membership	**-4773.1900**	**1797.2000**	**-2.66**	**0.0086**
OBRA 1990	-1646.5000	18496.5000	-0.09	0.9292

Estimates significant at the five percent level are in boldfaced print.

Table 2.10a: Three stage least squares parameter estimates. Dependent variable: Log of Medicaid Prescription Drug Expenditures (1985-1989).

Variable	Estimate	Standard Error	t	Approx Prob
constant	**14.2988**	**0.5879**	**24.32**	**0.0001**
Dispensing Fee	**-0.1561**	**0.0393**	**-3.97**	**0.0001**
Percentage Markup	**0.3665**	**0.0664**	**5.52**	**0.0001**
Medicaid Recipients	**0.4939**	**0.0294**	**16.83**	**0.0001**
Restricted Formulary	**0.4865**	**0.1036**	**4.70**	**0.0001**
Drug Utilization Review	0.1075	0.0642	1.67	0.0957
Drug Co-payment	**-1.0541**	**0.1276**	**-8.26**	**0.0001**
Percentage of pop. age 65+	**0.0375**	**0.0113**	**3.32**	**0.0010**
Percentage AFDC age 21-	-0.0092	0.0063	-1.46	0.1462
Percentage of pop. Metropolitan	**-0.0126**	**0.0029**	**-4.26**	**0.0001**
Per Capita Pharmacists	321.6326	295.3514	1.09	0.2774
Per Capita Physicians	**1169.8500**	**181.7862**	**6.44**	**0.0001**
Trend	0.0028	0.0170	0.16	0.8705
Limits on coverage for HI*1 cases	**0.6087**	**0.0839**	**7.25**	**0.0001**
Medicare principles for HI cases	0.1023	0.0808	1.27	0.2067
Limits on skilled nursing services	0.2371	0.1327	1.79	0.0755
Prior authorization for ICFMR*2	-0.1272	0.0843	-1.51	0.1329
Limits on physicians' HI visits	**-0.3918**	**0.0779**	**-5.03**	**0.0001**
Prior auth. for physicians' services	**0.1272**	**0.0622**	**2.05**	**0.0421**
Medicare principles physician	**0.3323**	**0.1170**	**2.84**	**0.0050**
Co-payment on physician	**0.4189**	**0.1371**	**3.06**	**0.0025**
Limits on coverage for HO*3 cases	**0.3196**	**0.1104**	**2.90**	**0.0042**
Medicare principles for HO cases	-0.1823	0.1076	-1.69	0.0916

Estimates significant at the five percent level are in boldfaced print. *1Inpatient Hospital. *2Intermediate Care Facilities Mental Retardation. *3Hospital outpatient

Table 2.10b: Three stage least squares parameter estimates. Dependent variable: Log of Medicaid Prescription Drug Expenditures (1990-1994).

constant	**11.3211**	**0.5387**	**21.02**	**0.0001**
Dispensing Fee	**0.1619**	**0.0385**	**4.2**	**0.0001**
Percentage Markup	**0.1585**	**0.0557**	**2.85**	**0.0049**
Medicaid Recipients	**0.2124**	**0.0105**	**20.33**	**0.0001**
Restricted Formulary	**0.3298**	**0.0981**	**3.36**	**0.0009**
Drug Utilization Review	**0.2617**	**0.0659**	**3.97**	**0.0001**
Drug Co-payment	-0.0013	0.0454	-0.03	0.9763
Percentage of pop. age 65+	**-0.0301**	**0.0111**	**-2.71**	**0.0072**
Percentage AFDC age 21-	0.0037	0.0062	0.59	0.5533
Percentage of pop. Metropolitan	**0.0157**	**0.0023**	**6.76**	**0.0001**
Per Capita Pharmacists	**7466.0900**	**920.8410**	**8.11**	**0.0001**
Per Capita Physicians	**657.7054**	**68.2239**	**9.64**	**0.0001**
Trend	**0.0590**	**0.0245**	**2.41**	**0.0167**
Limits on coverage for HI cases	**0.3557**	**0.0647**	**5.5**	**0.0001**
Medicare principles for HI cases	**0.1602**	**0.0610**	**2.63**	**0.0092**
Limits on skilled nursing services	-0.1059	0.1304	-0.81	0.4179
Prior authorization for ICFMR	**0.1766**	**0.0843**	**2.1**	**0.0373**
Limits on physicians' HI visits	0.1289	0.0690	1.87	0.0631
Prior auth. for physicians' services	**0.3447**	**0.0609**	**5.66**	**0.0001**
Medicare principles physician	0.1250	0.0676	1.85	0.0658
Co-payment on physician	-0.0382	0.0458	-0.83	0.4053
Limits on coverage for HO cases	0.0841	0.0829	1.01	0.3115
Medicare principles for HO cases	0.0442	0.0693	0.64	0.5239

Estimates significant at the five percent level are in boldfaced print.

SECTION II.VI: DISCUSSION AND POLICY IMPLICATIONS

This study investigated the influence of public interest factors and special interest groups on reimbursement levels of Medicaid covered prescription drugs. Regarding the former, there is little to no evidence supporting the hypothesis that relative budget surpluses and the share of states' Medicaid budgets devoted to prescription drug expenditures have any impact on reimbursement rates. On the other hand, the results indicate that states with high per recipient drug expenditures generally support lower reimbursement rates in the second time period.

Regarding the special interest groups the results indicate that the APhA, in particular, and the AMA have been successful in representing their members' interest. As

predicted, the number of pharmacists belonging to the APhA has a consistent positive effect on the reimbursement of both the individual components and the total profit reimbursement levels. The American Medical Association generally has a negative and significant impact on pharmaceutical drug reimbursements rates, especially in the second period. Similarly, the results suggest that the pharmaceutical manufacturing industry has a stronger influence in the second period. In contrast the Medicaid recipient group does not have a consistent impact on reimbursement levels, probably due to its limited political and organizational power.

In summary, this study finds that relative strengths of special interest groups, to a large extent, explain the observed variation in reimbursement levels of prescription drugs covered by the Medicaid program, particularly in the second period. Pertaining to the dispensing fee and percentage markup, the elasticity coefficients associated with the percentage APhA membership variable, calculated at the average values, are (0.074) and (0.113) in the first period. In the second period these elasticities rise to (0.250) and (0.590), respectively, indicating increased influence of this interest group. With an average dispensing fee and percentage markup of $3.00 and 10%, respectively, the second period elasticities imply that a 10% increase in the strength of the APhA would result in a 1.13% and 5.9% increase in the dispensing fee and percentage markup, respectively. Using an average drug price of $23.28 in 1994 and the approximate total number of drugs processed in that year, (385,845,921), this would increase expenditures by an estimated $13 million and $46 million, pertaining to dispensing fees and markup, respectively. This clearly demonstrates the impact that interest groups have on legislation and expenditure levels.

At the creation of Medicaid the federal government established a minimum level of services (both mandatory and optional) which must be covered under state run programs.[32] The argument for federal control was to ensure some equality regarding the medical treatment of the poor across the nation. Recent trends in the majority republican congress, however, indicate growing support for transforming AFDC into a block grant provided by the federal government to the states. The block grants would be based inversely on the states' per capita income, similar to the FMAP, providing states with the power to operate and finance their own programs.

A great deal of the existing literature has been devoted to explaining the observed variation in the coverage of services and the treatment of the poor under Medicaid across states.[33] The poor are not treated uniformly as pertaining to medical services provided by the Medicaid system.[34] One implication of a shift in the balance of power from the federal government to the state level could be a rise in the influence of interest groups and, consequently, an increase in the existing disparities in the treatment of the poor between states. This argument is further supported by the median voter model applied in the recipients equation. The tastes and preferences of the median voter at the state level have significant and consistent explanatory power regarding variation in the size of programs across states.

Drug reimbursement policies which determine per drug expenditures have a significant impact on aggregate drug expenditures. With the emphasis on the second period of the examination, states with higher dispensing fees and percentage markups have, on average, higher total drug expenditure budgets. This analysis also showed that a

strong relationship exists between the relative strengths of interest groups and the level of prescription drug reimbursements.

Consistent with the results obtained by others the results indicate that formularies do not have the intended effect on drug budgets.[35] Similar results are found for Drug Utilization Review programs and co-payments on physician services. On the other hand, a co-payment on drugs appeared to have generated some savings during the first period. In the second period, however, this variable becomes highly insignificant.

An interesting result from this analysis is the changing relationship between per capita income when considered at different levels of Medicaid programs. At the "ground level" of state decisions regarding the size of the program, concerning eligibility requirements, states with higher per capita incomes support larger groups of individuals. The states' ability and willingness to support larger numbers of the poor is linked to their per capita income. However, once eligibility requirements have been established and the focus is directed at financing the program, the relationship changes to a negative one. At the financing level a state's share of the cost varies directly with its per capita income, providing incentives to limit per recipient spending.

The changing structure of the equations, discussed in section III, is highly visible in the regression results. On the one hand, the influence of the APhA and AMA appeared to be consistent, in sign and significance, and growing over time. However, on the other hand, the impact of a substantial number of variables fluctuates both regarding statistical significance and the direction of their influence, particularly in the recipient and aggregate drug expenditure equations, reflecting dramatically changing attitudes and politics

surrounding the Medicaid program. Any future study, dealing with the same time period, should take this structural change into account, particularly regarding empirical analysis.

SECTION II.VII: ENDNOTES

[1] Pharmaceutical Benefits Under State Medical Assistance Programs (1982-1992). Nominal figures have been deflated to 1982-84 constant dollars.

[2] Estimated ingredient costs were obtained from Kathleen Adams, et al., "State Medicaid Pharmacy Payments and Their Relation to Estimated Costs," Health Care Financing Review, Spring 1994, Volume 15, Number 3, pp. 29.

[3] Gerry Kiefer, "The Kentucky Medical Assistance Program's dispensing fee reimbursement to pharmacists," Frankfort, KY, Legislative Research Commission, 1979, p.5

[4] E. Kathleen Adams, et al, "State Medicaid Pharmacy Payments and Their Relation to Estimated Costs," Health Care Financing Review, Spring 1995, Vol. 15, Number 3

[5] George J. Stigler, "The theory of economic regulation," Bell Journal of Economics and Management Science, Vol 2, Sep. 1971.

[6] Cone, N.R. and Dranove, D. (1986), "Why Did States Enact Hospital Rate-Setting Laws?", Journal of Law and Economics 29 (October):287-302.

[7] William J. Moore, "Why did states enact Medicaid drug utilization review programs?", LSU Working Paper.

[8] Frank Sloan, J. Mitchell, and J. Cromwell, "Physician Participation in State Medicaid Programs," Journal of Human Resources, 1978 (Suppl): 211-245

[9] Karl Kronebusch, "Medicaid and the Politics of Groups: Recipients, Providers, and Policy Making," Journal of Health Politics, Policy and Law, Volume 22, number 3, June 1997, pp. 846.

[10] William J. Moore, "Why did states enact Medicaid drug utilization review programs?", LSU Working Paper.

[11] Standard Industry Classification, 1995, p. 137.

[12] John F. Holahan and Joel W. Cohen, Medicaid: The Trade-off between Cost Containment and Access to Care, The Urban Institute Press-Washington, D.C., 1986, Chapter 3, "Eligibility."

[13] Martcia Wade and Stacy Berg, "Causes of Medicaid Expenditure Growth," Health Care Financing Review, Spring 1995, Volume 16, Number 3, pp. 16. (Besides establishing the income and resource criteria for eligibility, states have also been given the discretion to determine the amount, duration, and scope of covered services.)

[14] T. W. Grannemann, "Reforming National Health Programs for the Poor," In Pauly, M.V. (ed.) National Health Insurance: What Now, What Later, What Never?, Washington, DC.: American Enterprise Institute, 1980, pp. 104-136. See also: Karl Kronebusch, "Medicaid and the Politics of groups: Recipients, Providers, and Policy Making," Journal of Health Politics, Policy and Law, Volume 22, Number 3, June 1997, pp. 850.

[15] Martcia Wade and Stacy Berg, "Causes of Medicaid Expenditure Growth," Health Care Financing Review, Spring 1995, Volume 16, Number 3, pp. 12. See also: Omnibus Reconciliation Act of 1987.

[16] William J. Moore and Robert J. Newman, "Drug Formulary Restrictions as a Cost-Containment Policy in Medicaid Programs," Journal of Law & Economics, Vol. XXXVI, April 1993.

[17] William J. Moore, "Medicaid Drug Utilization Review: A Critical Appraisal," Medical Care Review, March 1993.

[18] Arleen Leibowitz, Willard Manning, and Joseph Newhouse, "The Demand for Prescription Drugs as a Function of Cost-Sharing," Prepared for the U.S. Department of Health and Human Services, Oct. 1985, N-2278-HHS.

[19] Moore, Newman, and Gutermuth, LSU working paper.

[20] Mark Miller, "The Role of Substitutes in Policy Analysis: Acute Care Services in State Medicaid Programs," Journal of Health Politics, Policy and Law, Vol. 13, No. 3, Fall 1988.

[21] Moore, Newman, and Gutermuth, LSU working paper.

[22] Mark Miller, "The Role of Substitutes in Policy Analysis: Acute Care Services in State Medicaid Programs," Journal of Health Politics, Policy and Law, Vol. 13, No. 3, Fall 1988.

[23] Penelope Pine, Steven Clauser, and David K. Baugh, "Chapter 12: Trends in Medicaid Payments and Users of Covered Services," Health Care Financing Review/ 1992 Annual Supplement, pp. 265.

[24] The Omnibus Budget Reconciliation Act of 1990, Section 4401. See also: Gurny, et al., "Chapter 14: Payment, Administration, and Financing of the Medicaid Program," Health Care Financing Review/ 1992 Annual Supplement, 1992, pp. 285-302

[25] Dr. Moore is a Professor of Economics at Louisiana State University.

[26] This test is generally referred to as the Chow test in reference to Chow (1960). Greene, William H., Econometric Analysis, Second Edition, Macmillan Publishing Company. New York, 1990, pp. 211-212.

[27] Arnold Zellner and H. Theil (1962) "Three Stage Least Squares: Simultaneous Estimation of Simultaneous Equations," Econometrica, 30, pp. 54-78. For an excellent synopsis see Judge et al., Introduction to the Theory and Practice of Econometrics, Second Edition, John Wiley & Sons, 1988, pp. 646-651.

[28] See, for example, E. Kathleen Adams, et al., "State Medicaid Pharmacy Payments and Their Relation to Estimated Costs," Health Care Financing Review, Vol. 15, Number 3 (Spring 1994): 25-42.

[29] Judge et al., Introduction to the Theory and Practice of Econometrics, Second Edition, John Wiley & Sons, 1988, pp. 365369.

[30] Paul Gurny, David K. Baugh, and Thomas W. Reilly, "Chapter 14: Payment, Administration, and Financing of the Medicaid Program," Health Care Financing Review/ 1992 Annual Supplement, 1992, pp. 298.

[31] Moore (1994), Moore and Newman (1993), Moore (1993), and Moore, Newman, and Gutermuth (1997).

[32] For an excellent synopsis of these services see: Paul Gurny, Marilyn Hirsch, and Kathleen Gondek, "Chapter 11: A Description of Medicaid-Covered Services," Health Care Financing Review/ 1992 Annual Supplement, 1992, pp. 227-234.

[33] Granneman (1980), Pine, Clauser, and Baugh (1992), Moore and Newman (1993), Tudor (1995), etc.

[34] See for example, Frank Sloan, Janet Mitchell, and Jerry Cromwell, "Physician Participation in State Medicaid Programs," The Journal of Human Resources, Volume XIII, Supplement 1978, pp. 211-245.

[35] William J. Moore and Robert J. Newman, "Drug Formulary Restrictions as a Cost-Containment Policy in Medicaid Programs," Journal of Law & Economics, Vol. XXXVI, April 1993.

SECTION II.VIII: BIBLIOGRAPHY

Adams, E. Kathleen, et al., "State Medicaid Pharmacy Payments and Their Relation to Estimated Costs," Health Care Financing Review, Vol. 15, Number 3 (Spring 1994): 25-42.

Becker, Gary S., "A Theory of Competition Among Pressure Groups For Political Influence," The Quarterly Journal of Economics., Vol. XCVIII, No. 3 (August 1983): 371-400.

Chavkin, David F., "Trends in State Administration of Medicaid Programs," Health Care Financing Grants and Contracts Report (October 1979).

Cone, Kenneth R. and David Dranove, "Why Did States Enact Hospital Rate-Setting Laws?", Journal of Law and Economics, Vol. XXIX (October 1986): 287-302.

Fanara, Philip Jr. and Warren Greenberg, "Factors Affecting the Adoption of Prospective Reimbursement Programs by State Governments," Incentives Versus Controls in Health Policy, A Marion Enterprise Institution (1985): 144-156.

Feldstein, Paul J., "An Economic Perspective on Health Politics and Policy," Quarterly Review of Economics and Business, Vol. 30, No.4 (Winter 1990): 117-135.

Feldstein, Paul J., "Congressional Voting Behavior on Hospital Legislation: An Exploratory Study," Journal of Health Politics, Policy and Law, Vol. 8, No.4 (Winter 1984): 686-701.

Kiefer, Gerry, "The Kentucky Medical Assistance Program's dispensing fee reimbursement to pharmacists," Frankfort, Ky., Legislative Research Commision (1979): Chapters III - V.

Gondek, Kathleen, "Prescription Drug Payment Policy: Past, Present, and Future," Health Care Financing Review, Vol. 15, Number 3 (Spring 1994): 1-7.

Graddy, Elizabeth, "Interest Groups or the Public Interest -- Why Do We Regulate Health Occupations?", Journal of Health Politics, Policy and Law, Vol. 16, No. 1 (Spring 1991): 25-49.

Grannemann, T.W., "Reforming National Health Programs for the Poor," In Pauly, M.V. (ed.) National Health Insurance: What Now, What Later, What Never?, Washington, DC.: American Enterprise Institute (1980): 104-136.

Greene, William H., Econometric Analysis, Second Edition, Macmillan Publishing Company, New York, (1990).

Gurny, Paul, Marilyn Hirsch, and Kathleen Gondek, "Chapter 11: A Description of Medicaid-Covered Services," Health Care Financing Review/ 1992 Annual Supplement (1992): 227-234.

Gurny, Paul, David K. Baugh, and Thomas W. Reilly, "Chapter 14: Payment, Administration, and Financing of the Medicaid Program," Health Care Financing Review/ 1992 Annual Supplement (1992):285-302.

Holahan, John F. and Joel W. Cohen, Medicaid: The Trade-off between Cost Containment and Access to Care, The Urban Institute Press, Washington, D.C. (1986).

Judge George G., R. Carter Hill, William E. Griffiths, Helmut Lütkepohl, and Tsoung-Chao Lee, Introduction to the Theory and Practice of Econometrics, Second Edition, John Wiley & Sons (1988).

Kronebusch, Karl, " Medicaid and the Politics of Groups: Recipients, providers, and Policy Making," Journal of Health Politics, Policy and Law, Volume 22, Number 3 (June 1997): 839-878.

Lamphere-Thorpe, Jo Ann, et al., "Who Cares What It Costs to Dispense a Medicaid Prescription?," Health Care Financing Review, Vol. 15, Number 3 (Spr.1994): 9-24.

Leibowitz, Arleen, Willard Manning, and Joseph Newhouse, "The Demand for Prescription Drugs as a Function of Cost-Sharing," Prepared for the U.S. Department of Health and Human Services, Oct. 1985, N-2278-HHS.

Marino, Francis A., et al, Principles of Pharmaceutical Accounting, Lea & Febiger, 1980

McMillan, John A. and Charlotte A. Jankel, "Medicaid Drug Cost Containment: An Economic Perspective," Journal of Research in Pharmaceutical Economics, Vol. 5(2) (1993): 69-87.

Miller, Mark," The Role of Substitutes in Policy Analysis: Acute Care Services in State Medicaid Programs," Journal of Health Politics, Policy and Law, Vol. 13, No. 3 (Fall 1988): 499-521.

Moore, William J., "Why did states enact Medicaid Drug Utilization Review Programs?", LSU Working Paper (1994).

Moore, William J. and Robert J. Newman, "Drug Formulary Restrictions as a Cost-Containment Policy in Medicaid Programs," Journal of Law & Economics, Vol. XXXVI (April 1993).

Moore, William J., "Medicaid Drug Utilization Review: A Critical Appraisal," Medical Care Review, (March 1993): 3-37.

Moore, William J., Robert J. Newman, and Karen Gutermuth, "A Comparative Analysis of Four Medicaid Cost-Containment Policies," Louisiana State University, Working Paper (1997).

Mueller, Keith J., "An Analysis of Congressional Health Policy Voting in the 1970s," Journal of Health Politics, Policy and Law, Vol. 11, No.1 (Spring 1986): 117-135.

Oster, Sharon M., "An Analysis of Some Causes of Interstate Differences in Consumer Regulations," Economic Inquiry, Vol. XVIII (January 1980): 39-54.

Peltzman, Sam, "Toward a More General Theory of Regulation," Journal of Law and Economics, Vol. XIX(2) (August 1976): 211-244.

Pine, Penelope, Steven Clauser, and David K. Baugh, "Chapter 12: Trends in Medicaid Payments and Users of Covered Services, 1975-91," Health Care Financing Review/ 1992 Annual Supplement (1992): 235-269.

Posner, Richard A., "Taxation by regulation," The Bell Journal of Economics and Management, Vol. 2, No.1 (Spring 1971): 22-50.

Schweitzer, Stuart O., "Understanding the Flow of Health Policy in the United States: Self-Interest or Ignorance?", Quarterly Review of Economics and Business, Vol. 30, No. 4 (Winter 1990): 140-147.

Sloan, Frank, Janet Mitchell, and Jerry Cromwell, "Physician Participation in State Medicaid Programs," Journal of Human Resources (1978 Supplement): 211-245

Stigler, George J. "The theory of economic regulation," Bell Journal of Economics and Management Science, Vol 2. (September 1971): 3-21.

Tudor, Cynthia G., "Medicaid Expenditures and State Responses," Health Care Financing Review, Volume 16, Number 3 (Spring 1995):1-10

Wade, Martcia and Stacy Berg, "Causes of Medicaid Expenditure Growth," Health Care Financing Review, Volume 16, Number 3 (Spring 1995): 11-25

Wendling, Wayne and Jack Werner, "Nonprofit Firms and the Economic Theory of Regulation," Quarterly Journal of Economics and Business, Vol. 20, No. 3 (Autumn 1980): 6-18.

Zellner, Arnold. and H. Theil "Three Stage Least Squares: Simultaneous Estimation of Simultaneous Equations," Econometrica, 30 (1962): 54-78.

CHAPTER III

ALTERNATIVE REIMBURSEMENT METHODS AND MEDICAID HOSPITAL EXPENDITURES

SECTION III.I: INTRODUCTION

Hospital inpatient services have historically claimed a relatively large percentage of the nation's medical outlays. Nationally, 35.4 percent of all health care expenditures were devoted to hospital inpatient services in 1995. For the Medicare and Medicaid public health programs the percentages of outlays devoted to hospital services were 48.2 and 24.0, respectively[1]. Regarding Medicaid, inpatient hospital expenditures have claimed a relatively large proportion of total outlays since the inception of the program (Table 3.1). The data in Table 3.1 also shows the growth rates in inpatient hospital expenditures indicating large fluctuations over time. The average real growth rate during the latter half of the 1970s was 3.8 percent, dropping to 0.5 percent during the 1980s. The 1990s were also marked by large fluctuations, with average growth rates of 11.6 and -3.4 percent, respectively, from 1990 to 1992 and 1993 to 1996.

Given the relative size of hospital inpatient budgets, control over this component of medical care is crucial in states' endeavors to subdue the growth of Medicaid expenditures. With this goal in mind, provider reimbursement methods became an important issue almost immediately following the adoption of this program. This is the first of two papers investigating to what extent the adoption of different provider reimbursement methods have been responsible for the observed periodical declines in Medicaid inpatient hospital expenditures.

Table 3.1: Medicaid payments in real (medical care price index) 1982-1984 millions of dollars for general inpatient hospital services (1975-1996).

1975	$25,773	$7,103	27.6		
1976	27,098	7,510	27.7	5.7	(1975-1979)
1977	28,489	8,004	28.1	6.6	**3.8**
1978	29,113	8,078	27.7	0.9	
1979	30,329	8,378	27.6	3.7	
1980	31,123	8,561	27.5	2.2	
1981	32,815	8,678	26.4	1.4	
1982	31,783	8,292	26.1	-4.4	
1983	32,198	8,760	27.2	5.7	
1984	31,733	8,285	26.1	-5.4	(1980s)
1985	32,920	8,230	25.0	-0.7	**0.5**
1986	33,375	8,392	25.1	2.0	
1987	34,593	8,640	25.0	3.0	
1988	35,048	8,826	25.2	2.2	
1989	36,406	8,883	24.4	0.6	
1990	39,748	10,201	25.7	14.8	(1990-1992)
1991	43,381	11,201	25.8	9.8	**11.6**
1992	48,036	12,323	25.7	10.0	
1993	50,421	12,749	25.3	3.5	
1994	51,067	12,367	24.2	-3.0	(1993-1996)
1995	54,370	11,899	21.9	-3.8	**-3.4**
1996	51,689	10,669	20.6	-10.3	

Source: Health Care Financing Administration, Form 2082.

Prior to 1983, hospitals which participated in public health programs were primarily reimbursed for the reasonable cost of services rendered to covered patients. The inefficiencies inherent in the fee for service (FFS) or "retrospective" provider reimbursement approach have been widely discussed in the literature.[2] Since retrospective payment amounts are based on incurred costs they do not provide any incentives toward economizing of medical resources. This cost based approach was recognized as inflationary, prompting Congress to authorize broad based experiments and demonstration projects to determine the feasibility of alternative reimbursement methods. These experiments were originally directed toward the Medicare program.

> "In 1967, section 402(a) of Public Law 90-248 delegated authority to the secretary to experiment with alternative methods of reimbursement -- specifically, incentive reimbursement. This authority was further broadened in 1972 under section 222(a) of the Social Security Amendments of 1972 (Public Law 92-603). Under these amendments, prospective reimbursement methods were devised and tested for their ability to stimulate providers through positive (or negative) incentives to use their facilities or personnel more efficiently and thereby to reduce the total costs of the health programs involved without adversely affecting the quality of services ..."[3]

The experiments were not limited to public health programs and shortly thereafter several states began using prospective payment methods for the reimbursement of hospital costs. Some states had comprehensive systems encompassing virtually all payer types, while others only affected reimbursement from selected sources. However, the common goal was to reduce the growth of hospital expenditure levels by directly regulating prices and costs. States which enacted hospital rate setting laws expected to have lower expenditure levels.[4,5,6] Following more than a decade of debate, the 1983 Amendments to the Social Security Act, provided for a prospective payment system (PPS) based on diagnosis related groups (DRGs) for short-term hospital inpatient services rendered to Medicare patients. This PPS involves all Medicare patients throughout the nation.

Medicaid reimbursement to providers had also traditionally been based on FFS methods. As was the case with Medicare, Congress demonstrated an interest in encouraging experimentation with alternative reimbursement methods regarding Medicaid. To facilitate this OBRA 1981 (Section 2173) made it easier for states to experiment and adopt alternative payment systems. In addition to prospective payment methods, states also adopted direct utilization controls in their attempt to reduce the

growth of hospital outlays. Similar to prospective payment, the goal of these controls is to discourage over utilization of services and to promote efficiency and cost effectiveness.

The 1980s witnessed a steady increase in the number of states adopting prospective payment systems (PPS). By 1989, 43 states had adopted a form of a PPS.[7] At the same time, however, state Medicaid hospital inpatient outlays generally continued to rise. Growth rates in real Medicaid general hospital inpatient expenditures are shown in Table 3.1. Given the continued increases in both hospital inpatient and overall Medicaid budgets, state agencies began experimenting with managed care, hoping to capitalize on the associated financial incentive systems which have proven successful in the private sector. From 1991 to 1996 the number of states which had Medicaid recipients enrolled in some managed care program increased from 33 to 49. The average recipient participation in managed care programs, including only states with positive enrollment, increased from 88,961 in 1991 to 255,730 in 1996.[8]

Regarding Medicaid the federal government gave states considerable discretion over the implementation and administration of hospital cost containment policies, resulting in fifty four differently structured programs.[9] This discretion includes the methods and standards utilized for reimbursing participating providers. An interesting question, arising from this legislative and bureaucratic diversity, concerns the decision making process behind the adoption of a given reimbursement method. This paper examines the factors which determine why some states adopted the different types of PPSs, direct utilization, and managed care programs concerning the reimbursement and delivery of hospital services by Medicaid.

The importance of understanding this decision making process is twofold. First, the initial intent of the Medicaid program was to provide medical services to the nation's poor in an efficient and equitable fashion, and in the quantities and qualities generally observed in the private sector. The nature of the decision making process may shed some light on whether this goal has been compromised at the state level. Second, private sector third party payers often follow the policies of state Medicaid programs. The remainder of this section discusses the prospective payment, coverage limitation methods, and managed care programs which states have adopted in their attempt to contain Medicaid hospital costs. Section three explores the theoretical model and the variables employed to explain the adoption of those policies. Following that, section four briefly discusses the data, data sources, and econometric methods employed in the estimation. Section five presents the empirical results, followed by a summary and discussion of policy implications.

Prospective Payment Systems (PPS).

Under PPSs reimbursement rates are determined by the state prior to the delivery of services. The state generally establishes a reimbursement rate for a base year using data on the average cost of providing medical services. An inflation adjustment is made for subsequent years. Participating providers receive this pre-specified reimbursement rate for each unit of service regardless of the cost of actual resources used. Hospitals which provide services at a cost below the prospective payment realize a profit, while those that have costs exceeding the fixed payment suffer a loss. This creates powerful financial incentives for providers to minimize costs by emphasizing efficient methods of treatment and by reducing utilization of inputs. Indeed, the switch from a cost based to a

prospective payment system, based on diagnostic-related groups (DRGs)[10], has been associated with decreased use of hospital inputs in the case of Medicare.[11] Within the Medicaid system, the goals of a PPS are to curb the rate of increase in the unit price of services, reduce the rate of increase in overall expenditures for hospital services, and to eliminate inequities among hospitals.

Medicaid agencies are employing any combination of three different forms of prospective payment systems. The first is called a rate-of-increase control system, under which providers are paid a fixed rate, either per day or per case, generally based on the institutions' average costs. States using this method typically impose a rate ceiling, and make adjustment based on the type or location of a particular facility. Furthermore, adjustments for inflation are applied periodically. Thus, the payment rate can be expressed in functional form as

$$p_1 = P(c,t,l) \tag{3.1}$$

where p_1 is the prospective payment rate, c is the average cost of the institution, and t and l represent the type and location of the institution.

The second form is referred to as a prospective case-mix system, where payment rates are based on patients' diagnoses. This PPS has received the most attention in the literature, perhaps because it was adopted as the method of payment regarding short-stay hospital care for the Medicare program in 1983.[12] Each hospital inpatient is classified according to a particular DRG which has an associated weighing factor. The weight reflects the concentration of hospital resources used for providing care to the average patient in that DRG, calculated across all hospitals. Multiplying an associated weighting factor by a predetermined rate yields the reimbursement rate to the provider. The

predetermined rate can vary according to institution or type of institution, for example based on size, urban versus rural location, or teaching status. The PPS payment per discharge may be represented as

$$p_2 = [(w \times s) + o] \times (1 + a) \qquad (3.2)$$

where p_2 is the PPS payment per discharge, w is the DRG weight, s is a standardized payment amount, o represents a potential outlier payment, and a represents a hospital adjustment factor.[13]

There is crucial difference between a rate-of-increase control and DRG based system: in the former the prospective rate is determined starting with the particular institution's average cost, while, in the latter, the rate is determined starting with a national or state average cost. Clearly, the former provides more flexibility in rates. Furthermore, states implementing rate-of-increase controls may not impose limitations on the number of inpatient days. Thus, losses resulting from higher than average use of resources could be offset by increasing the number of inpatient days.

Third, states may use a negotiated PPS where institutions make competitive bids to obtain a "license" to participate in the program. Recipients must use "licensed" providers in case of non-emergencies. Negotiated PPS has not been widely embraced by states and will, therefore, not be considered in the empirical analysis. Indeed, in 1992 Delaware was the only state to employ this PPS.[14]

Direct utilization control

Another policy option available to states is to impose direct controls on the utilization of hospital services. Utilization controls may take the following forms:

1. Limits on inpatient days per year implying a fixed maximum number of days which will be covered annually by Medicaid per recipient.
2. Limits on inpatient days per stay which may be fixed or varied according to the diagnosis.
3. Prior authorization in the case of non-emergency admissions. According to this policy hospitals will not be reimbursed for "discretionary" admissions for which no prior authorization was obtained from the Medicaid agency.
4. Prior authorization for specific services. This is similar to point three but applies only to certain elective procedures.

Table 3.2: States which utilized a prospective payment system in 1994.

State			
Alabama	.	.	Yes
Arkansas	.	Yes	Yes
California	.	Yes	Yes
Colorado *	Yes	Yes	Yes
Connecticut	.	.	Yes
Delaware	.	Yes	.
Florida	.	Yes	Yes
Georgia	.	Yes	.
Hawaii	.	Yes	Yes
Iowa	Yes	.	Yes
Idaho	.	.	Yes
Illinois *	Yes	Yes	Yes
Indiana	Yes	.	.
Kansas	Yes	.	Yes
Kentucky	.	Yes	Yes
Louisiana	.	Yes	Yes
Massachusetts	.	Yes	Yes
Maryland	.	.	Yes
Maine	.	.	Yes
Michigan *	Yes	Yes	Yes

Source: Health Care Financing Administration spDATA System.
*States which utilize both a DRG based and a rate of increase control approach. In this year there were 39 PPS states, 10 of which used both approaches. (Table Con'd.)

Table 3.2: Continued

Minnesota	Yes	.	.
Missouri	.	Yes	Yes
Mississippi	.	Yes	Yes
Montana	Yes	.	.
North Carolina	.	.	Yes
North Dakota	Yes	.	.
Nebraska	.	Yes	Yes
New Hampshire*	Yes	Yes	Yes
New Jersey	Yes	.	Yes
New Mexico *	Yes	Yes	Yes
Nevada	.	.	Yes
New York *	Yes	Yes	Yes
Ohio *	Yes	Yes	Yes
Oklahoma	.	Yes	Yes
Oregon	Yes	.	Yes
Pennsylvania	Yes	.	Yes
Rhode Island	.	Yes	.
South Carolina *	Yes	Yes	.
South Dakota	Yes	.	Yes.
Tennessee	.	Yes	Yes.
Texas	Yes	.	Yes
Utah *	Yes	Yes	Yes
Virginia	.	Yes	Yes
Vermont	.	Yes	.
Washington	Yes	.	Yes
Wisconsin *	Yes	Yes	.
West Virginia	.	.	Yes

Utilization controls are also designed to curb per recipient spending, for example by limiting the number of days a patient remains in the hospital. Notice, that severe limits, particularly per case limits, could discourage hospitals from serving Medicaid patients resulting in fewer recipients as well. On the other hand, prior authorization is clearly directed at reducing the number of recipients. Table 3.2 indicates whether a state employed a PPS or direct utilization control in 1994.

Managed care

State Medicaid agencies employ three types of managed care programs:[15] (1) those which reimburse providers on a FFS basis, generally referred to as primary care case management (PCCM); (2) those which utilize networks of physicians who are paid on a "capitated" or "financial-risk" basis; and (3) those which enroll Medicaid enrollees in health maintenance organizations (HMOs). Observe that the term PCCM is sometimes used as encompassing all three types of programs. In this paper it will be used to refer to programs which reimburse participating providers on a FFS basis. Under PCCM participating providers act as gatekeepers to the medical care received by enrollees. The providers are reimbursed retrospectively for services rendered and ordinarily receive an additional fixed periodical payment, usually monthly, for each of their enrollees. This approach does not provide the financial incentives which are generally associated with prepaid managed care but instead relies on enhanced continuity of care to generate long-term savings.[16, 17]

Under managed care, participating providers, generally existing HMOs or other prepaid health plans (PHP), receive a fixed amount per patient for a given time period, regardless of the amount of resources actually devoted. This severing of the link between reimbursement amounts and incurred costs constitutes the "risk" of prepaid managed care. Institutions which manage to provide for their enrolled patient group at an average cost below this fixed payment will enjoy a profit. Conversely, those which have an average cost above the fixed payment suffer a loss. This generates powerful financial incentives for participating providers to minimize the utilization of resources.

SECTION III.II: THE MODEL

Legislation regarding the Medicaid program, particularly concerning matters of reimbursement levels and methodologies is an important determinant of hospital inpatient expenditures. Previous research indicates that PHPs and utilization controls have reduced Medicaid and Medicare hospital spending. In a multivariate analysis, using various combinations of prospective reimbursement and utilization control, Zuckerman (1987) showed that, concerning Medicaid, these policies are indeed associated with lower per recipient spending, and, in case of the latter, reductions in recipients as well.[18] Custer et al. (1990) also provides evidence that prospective reimbursement methods have been successful in decreasing the use of hospital inputs in the case of Medicare. The evidence for savings generated by managed care is also plentiful in the empirical literature.[19] In light of this empirical evidence, combined with the overwhelming theoretical cost containment arguments in favor of PPSs and managed care, one may question why Medicaid agencies have been reluctant to adopt these policies.

Theoretical framework: special interests, public interests and the median voter

Legislative outcomes have been explained by two main theories. The economic theory of legislative decision making emphasizes the role of interest groups which demand legislation that benefits them. According to this view, groups which are, or potentially would be, affected by particular legislation are willing to pay a price to influence the outcome. The price may be expressed in terms of campaign contributions, volunteer time, or the promise of favorable votes during future elections.[20]

For example, provider groups are unlikely to be indifferent between prospective and retrospective cost based systems. Furthermore, this method, while not primarily

directed at reducing the number of inpatient recipients, could also result in fewer Medicaid cases if rates were set prohibitively low. Medicaid recipients would become a liability to hospitals, which would then be reluctant to serve this group. Therefore, the adoption of a prospective payment system is likely to be the product of, among other variables, the interaction of the affected provider and recipient groups.

Alternatively, legislators may make decisions based on their perceptions of the public interest. Accordingly, interventions in industries result largely from the public's demand for legislative action. Factors such as existing budget pressures may be significant in this respect. The median voter model, which argues that legislation is based on the preferences and tastes of the median voter, has been used to explain the provision of public services. In the context of public health, this model describes taxpayers as utility maximizers who derive satisfaction from the consumption of goods and services as well as the transfer of income to welfare recipients. The quantities of consumption goods and services and public goods are determined by maximizing the following objective function subject to a budget constraint:

$$\max_{\{X,W\}} U(X,W,Z) \quad s.t. \quad Y = P_x X + P_w W \tag{3.3}$$

where X is the quantity of Medicaid services provided and P_x is the tax price to the median voter of an additional unit of service provided.[21] W represents a composite bundle of goods and services, with price P_w, consumed by the median voter, and Z is a set of exogenous factors which influence the median voter's preferences for W or X.

Model Variables

The following is a description of the special interest, public interest, and median voter variables employed in the model.

Interest group variables

There are several interest groups which could be affected by legislation concerning Medicaid hospital expenditures. Groups which share common objectives will likely cooperate with one another, while those with opposing goals will compete against each other in the lobbying process. The resources that each group is willing to allocate toward obtaining their goals will depend, among other factors, on the potential gains or losses from specific legislation.[22] Some of these groups, such as hospitals and physicians will be affected directly, while others will notice the impact indirectly. The following groups have been identified as having either a direct or indirect interest in Medicaid related hospital reimbursement policy.

- **Hospitals.** This group is expected to oppose any legislation directed towards limiting reimbursements to hospitals. Spending or hospital revenue caps, for example, would impair hospitals' ability to expand and increase their services, and may even result in financial difficulties. The strength of hospitals is measured in terms of the size of this industry approximated by the per capita hospital beds.
- **Physicians.** Any approach which reduces or freezes physician's charges, directly or indirectly, will likely result in a fall in physicians' incomes. Furthermore, inadequate payments for Medicaid patients, restricting hospitals' ability to hire additional personnel or implement new technologies and facilities, would also diminish physicians' productivity. Physicians are, therefore, expected to favor higher payments for Medicaid hospital patients and oppose prospective payment approaches. The political influence of physician groups is represented politically by the percentage of physicians who are members of the American Medical Association (AMA).

- **Insurance companies.** Although they did not use these groups in their empirical analysis, Feldstein and Melnick identified insurance companies, unions, and the aged as having an interest in lower hospital costs.[23] Hospitals which receive inadequate payments for Medicaid or uninsured patients will attempt to compensate for this by shifting the cost to private pay patients.[24] The cost of the bulk of such private pay patients is covered by private insurance companies. Inadequate Medicaid payment levels could result in increased prices charged to non-Medicaid patients and, consequently, force higher premiums charged by private insurance companies. Private insurance companies are, therefore, expected to support higher Medicaid payments for inpatient recipients. The influence of this groups is measured in terms of the percentage of private citizens with private insurance.
- **Labor unions.** A similar argument applies to labor unions. Lower insurance premiums imply savings from health care benefits, which may translate into increases in other fringe benefits or wage rates received by union members. These groups are therefore also expected to favor increased Medicaid payments to hospitals. The percentage of the labor force which is represented by unions is used to capture the influence of this group.
- **Recipients.** The existing empirical evidence indicates that prospective payment methods reduce per case hospital expenditures. Lower payment levels may result in fewer resources, such as time and elective diagnostic testing, devoted to Medicaid patients. Furthermore, sufficiently low reimbursement levels will make Medicaid patients a liability which hospitals will attempt to avoid, resulting in fewer recipients served. In the case of direct utilization controls, such as a requirement of prior

authorization, the evidence indicates a reduction in the absolute number of recipients.[25] Recipient groups are therefore expected to oppose these alternative reimbursement and cost containment methods.

Medicaid recipients, however, generally belong to low income groups possessing neither the resources nor the disposition for political organization.[26] Legislators can afford to ignore the interests of these groups in the decision making process. For this reason, this group is not expected to have a strong impact on legislative decisions regarding prospective payment and direct utilization control.

Another notion which may affect the influence of the recipient population variable is the tradeoff between quantity and quality. Medicaid agencies may decide to cover a large population but limit the expenditures per recipient. Alternatively, they may enhance the services offered to individual recipients but limit the size of the eligible population. Thus, states servicing a larger Medicaid population may be more inclined to limit per recipient expenses by adopting PPS or utilization controls. The recipient group is represented by the number of recipients to population ratio.

Public interest variables

The following variables are used to capture the public's interest in Medicaid legislation.

1. **Budget pressures**. States' decisions to enact cost containment policies may reflect budget pressures. States which are experiencing large relative budget deficits, for example, are expected to be more likely to adopt legislation aimed at reducing costs. The state's relative budget deficit is defined as,

$$\text{Relative Budget Deficit} = \frac{\text{state revenues - state expenditures}}{\text{state revenues}}$$

- **The tax price.** The price to the median voter at the state level is determined by the federal Medicaid assistance percentage (FMAP), calculated as

$$StateShare = \left[\frac{\text{State Per Capita Personal Income}}{\text{National Per Capita Personal Income}}\right]^2 \times 0.45 \qquad (3.4)$$

The higher the federal government's share the smaller the incentive of the median voter will be to adopt prospective payment systems or enact coverage limits on hospital inpatient services. A negative relationship is expected between the FMAP and the probability of states adopting cost containment policies.

- **The percentage of AFDC recipients under the age of 21.** The median voter is hypothesized to have a higher preference for providing public goods to children. Therefore, the percentage of AFDC recipients under the age of 21 is included in the model.[27] A negative impact on the probability of PPS or coverage limits is expected.
- **The percentage of African American recipients.** Conversely, the median voter is expected to have a lower preference for providing public goods to minorities. To test this hypothesis, the percentage of African American recipients is included in the model. In this case the probability of PPS or coverage limits is expected to rise with this variable.
- **Welfare outlays.** Current welfare outlays as a percentage of the state's budget is used to measure the median voter's overall tastes and preferences for providing public goods. Higher percentages are hypothesized to indicate a favorable disposition

toward the provision of public goods. In such states a lower probability of cost containment and utilization control is expected.

- **Political ideology**. In addition to the cost of taxation and budget pressures the prevailing political ideology is hypothesized to play a role in the decision making process.[28] It is generally believed that a more liberal sentiment favors public welfare programs such as Medicaid. To capture the effect of the dominant political ideology, the percentage of congressional democratic representatives in the state is used. Democratic representatives generally have more liberal views and are assumed to favor higher outlays for public welfare programs. In the context of this paper, the probability of establishing PPSs and direct utilization controls and managed care enrollment would be negatively related to the percentage of representatives who are democrat.
- **Inter party competition (IPC).** A second political variable which has been hypothesized to effect public programs is the amount of competition among parties.[29] When a high degree of competition exists among parties, political candidates will reach out to the relatively uncommitted poor by promising better benefits. Consequently, the marginal power of the recipient group increases, which may imply a lower probability of cost containment measures being implemented. The IPC is constructed at the state level by considering the composition of the lower and upper houses and the gubernatorial office in each state. First, an index of democratic dominance is constructed as

$$D_i = \left(G_i^D + \frac{L_i^D}{L_i} + \frac{U_i^D}{U_i} \right) \Big/ 3 \qquad (3.5)$$

where $G_t^D = 1$ if a democratic governor is in office, or zero otherwise; L_t^D and L_t are, respectively, the number of democratic electives and the total number of seats in the lower house; and U_t^D and U_t are, respectively, the number of democratic electives and the total number of seats in the upper house. Thus, D_t ranges from zero to one. Extreme values would indicate total dominance by one party. An index of 0.5 would imply an evenly divided representation and, therefore, a high degree of competition. The IPC index is constructed as

$$IPC = \begin{cases} D_t & \text{if } D_t \leq 0.5 \\ (1 - D_t) & \text{if } D_t > 0.5 \end{cases} \tag{3.6}$$

generating a number between 0 and 0.5, where increasing values imply increasing competition.

SECTION III.III: DATA AND ESTIMATION METHODS

The data consists of a cross section of 47 states and a time series of six years.[30] Data sources include annual publications of Health Care Financing Administration (HCFA) forms 2082 (recipient) and 64 (financial), the Medicaid spData system by the HCFA, the Statistical Abstract of the United States (1985 – 1997), Medical, Practice Data by Census Division, State, and County Group by the American Medical Association, Pharmaceutical Benefits Under State Medical Assistance Programs by the National Pharmaceutical Council (1985-1997), EBRI Databook on Employee Benefits by the Employee Benefit Research Institute, data collected by Professor William J. Moore at Louisiana State University on American Medical Association membership, and data collected by Professor Barry Hirsch at Florida State University on the extent of state unionization.

The endogenous variables are as follows:

1. a dummy variable indicating whether a state uses a PPS based on DRGs.
2. a dummy variable indicating whether a state uses a PPS based on rate-of-increase controls.
3. a dummy variable indicating whether a state uses direct utilization controls.
4. the percentage of the Medicaid population enrolled in any type of managed care.
5. the percentage of the Medicaid population enrolled in risk-based managed care programs.

The first three equations are estimated using a probit procedure. The fourth and fifth equations are estimated using the tobit estimator.[31] Particularly in the case of capitated managed care enrollment a large number of observations have a zero value for the endogenous variable, resulting in a censored sample. Ordinary least squares is, therefore, no longer consistent or efficient. Data on managed care enrollment was not available for years prior to 1991. The fourth and fifth equations can therefore be estimated for the 1991 to 1996 period only. For ease of comparison the remaining equations are also estimated for the latter six years.

SECTION III.IV: EMPIRICAL RESULTS

The results of the regressions are shown in Table 3.3. Each column contains the results of either a Probit or Tobit regression for one of the five dependent variables: the use of a DRG based PPS, rate-of-increase control PPS, coverage limits, the overall percentage of managed care enrollment, and the percentage of capitated managed care enrollment.

Table 3.3: Regression estimates.

Constant	**8.1028 (3.44)**	**-4.9643 (-2.34)**	**-6.0410 (-2.42)**	**171.8769 (2.40)**	**250.6532 (2.91)**
Trend				**15.4291 (5.77)**	5.1714 (1.53)
Deficit	1.4396 (1.67)	-0.3390 (-0.38)	0.4578 (0.50)	**89.0711 (2.79)**	**85.3692 (2.27)**
Per capita beds	-0.0932 (-1.10)	**0.3211 (4.10)**	-0.0383 (-0.53)	-4.5845 (-1.68)	**-23.1675 (-5.07)**
Percentage AMA	-0.0063 (-1.04)	-0.0055 (-0.92)	0.0008 (0.12)	-0.0065 (-0.03)	**0.6094 (2.18)**
Percentage population covered by private insurance	-0.0167 (-0.85)	0.0313 (1.76)	**0.0905 (3.91)**	-0.2591 (-0.43)	0.2114 (0.28)
Percentage workforce represented by Union	**-0.0927 (-4.57)**	**0.0471 (2.53)**	**-0.0720 (-3.34)**	0.4923 (0.76)	1.1319 (1.48)
Recipients to population ratio	**21.7838 (4.81)**	**-9.2868 (-3.40)**	1.6428 (0.69)	14.6708 (0.16)	-251.013 (-1.75)
Federal Medicaid Assistance Percentage	**-0.0586 (-3.32)**	0.0271 (1.78)	0.0115 (0.71)	**-0.9453 (-1.82)**	**-2.0036 (-3.01)**
Percentage AFDC age 21 and less	**-0.0561 (-3.87)**	0.0127 (0.96)	**-0.0432 (-3.15)**	**-1.7434 (-3.87)**	**-2.6716 (-4.91)**
Percentage African American	0.0050 (0.98)	**-0.0129 (-2.54)**	0.0024 (0.41)	-0.2224 (-1.32)	0.01 (0.05)
Welfare share of budget	**-4.2451 (-2.97)**	-1.9269 (-1.74)	-0.5624 (-0.47)	**-115.8138 (-3.00)**	94.0626 (1.77)
Inter-party competition index	-1.1995 (-1.49)	**1.8303 (2.38)**	1.0912 (1.31)	-38.237 (-1.46)	-30.6947 (-0.94)
Percentage democratic representatives	0.0058 (1.54)	0.0030 (0.81)	**0.0138 (3.44)**	**0.2412 (1.96)**	0.2257 (1.47)

Coefficients which are significant at either the 1 or 5 percent level are in boldfaced print.

Prospective payment systems based on Diagnosis Related Groups

The adoption of a DRG based PPS is mainly determined by the median voter variables. All special interest variables have the predicted influence but are generally not significant. The estimates imply that labor unions, in particular, were successful in protecting their members' interests. Better funded public health inpatient programs reduce hospitals' need to shift costs to the privately insured. The estimated positive

coefficient associated with the recipient to population ratio variable indicates that states with large programs are more likely to adopt this cost containment measure.

Regarding the median voter variables, the larger the share of expenditures funded by the federal government, implying a lower tax price, the less likely the adoption of this cost containment policy. Furthermore, the median voter was hypothesized to have a higher preference for providing public health care to children and a lower preference to support minorities. Accordingly, higher percentages of AFDC recipients under the age of 21 and higher percentages of African Americans are, respectively, associated with lower and higher probabilities of states using a DRG based PPS to contain costs. The welfare share of the state budget was used to measure the median voter's disposition toward supporting public health programs. Supporting this hypothesis, the estimated coefficients indicate a lower probability of a DRG based PPS when the welfare share of the states' budget is relatively high. The inter-party competition index and the political ideology of the state, measured in terms of the percentage of democratic representatives, do not have a statistically significant impact on the probability of a DRG based PPS.

Rate of increase controls

In comparison to the first equation, the special interest variables perform differently. The percentage of AMA membership and the percentage of the population covered by private insurance variables remain insignificant. The hospital and union variables, however, are statistically significant with a positive influence.

An explanation of this seemingly contradictory result may lie in the differences between these two types of prospective payment systems. Rate-of-increase control systems allow for more flexibility in reimbursement rates (see Section I). Regarding the

adoption of a PPS, interest groups face choices at different stages. At the first stage a choice must be made whether to support or oppose the alternative reimbursement system. If a group opposed to prospective payment is successful in blocking its enactment the process stops after this stage. The second stage represents a situation where the adoption of a PPS is imminent and a choice must be made regarding the type of system. At this stage, groups which are opposed to PPS are hypothesized to continue to lobby against the system which represents the most harm to their interests. To test this hypothesis an auxiliary Probit regression was executed including only states using a PPS, to examine the choice of system providing that a switch was made to prospective payment. The results, shown in the appendix to this paper, indicate that hospitals, private insurance groups, and unions favor rate-of-increase control over DRG based systems in this choice.

In contrast with the first regression, states with high recipient to population ratios tend to have a lower incidence of this type of PPS. Also contrary to the predictions made in Section II states with a larger percentage of African American recipients have a lower probability of adopting this PPS.

The public interest variables appear to have little impact on the adoption of rate of increase policies. On the other hand, the estimated coefficient associated with the welfare share of the budget, measuring the median voter's disposition toward public programs, is negative (although significant only at the 10 percent level) as expected.

Coverage limitations

The model does not explain the use of coverage limits well. With the exception of the percentage of AFDC children under 21 years of age, the estimated coefficients are generally either insignificant or contrary to expectations. This is likely the result of

limited variation in the dependent variable. As shown in Table 3.2 an overwhelming majority of states employ coverage limits.

Managed care

Regarding managed care, existing budget pressures, measured by the states' relative budget deficits, are highly significant and carry the predicted sign. The results also indicate that the hospital interest group has been successful in protecting its members' interests in the case of capitated managed care. Contrary to expectations, however, the estimated coefficient associated with AMA membership is positive. Regarding the median voter variables, states with a lower tax-price, indicated by a higher FMAP, tend to have lower percentages of recipients enrolled in managed care. Furthermore, states with higher percentages of AFDC children have statistically significant lower enrollment. Finally, the welfare share of the state budget, measuring the median voter's disposition toward public programs, exhibits the predicted effect in the overall managed care enrollment equation.

SECTION III.V: DISCUSSION AND POLICY IMPLICATIONS

The analysis has shown that Medicaid state hospital cost-containment policies are influenced by both interest group and median voter variables. To the extent that these policies differentially impact Medicaid hospital services and expenditures, we can expect discrepancies in the treatment of Medicaid recipients across state borders. If public interests were driving these policy changes, one could at least argue that the public interest is being served. In many cases, however, policies are influenced by provider group interests. The quality and cost of Medicaid hospital care across the states will vary depending on the relative strength of interest groups as well as taxpayers' generosity.

SECTION III.VI: ENDNOTES

[1] National percentage was obtained from the Statistical Abstract of the United States. Medicare and Medicaid percentages were obtained from the Health Care Financing Administration, Health Care Financing Review, Fall 1996.

[2] Burton A. Weisbrod, "The Health Care Quadrilemma: An Essay on Technological Change, Insurance, Quality of Care, and Cost Containment," Journal of economic Literature, Vol. XXIX, (June 1991), pp. 523-552.

[3] Health Care Financing Grants and Contracts Reports, Health Care Financing Administration, Office of Research, Demonstrations, and Statistics, August 1980.

[4] Kenneth R. Cone and David Dranove, "Why did States Enact Hospital Rate-Setting Laws?," Journal of Law & Economics, Volume XXIX, 1986, pp.287-302

[5] David Dranove and Kenneth Cone, "Do State Rate Setting Regulations Really Lower Hospital Expenses," Journal of Health Economics, Number 4, 1985, pp.159-165.

[6] J. Warren Salmon, H. Stephen Lieber, Mary C. Ayesse, "Reducing Inpatient Hospital Costs: An Attempt at Medicaid Reform in Illinois," Journal of Health Politics, Policy and Law, Volume 13, Number 1, Spring 1988, pp.103-127.

[7] Susan Laudicina, "State Systems For Hospital Payment (prepared for the Prospective Payment Assesment Commission)," The George Washington University, April 1989.

[8] U.S. Department of Health and Human Services, Health Care Financing Administration, Office of Managed Care. 1996 National Summary of State Medicaid Managed Care Programs.

[9] The fifty four regions, which have different programs, include all states, except Arizona, the District of Columbia, the Virgin Islands, Puerto Rico, Guam, and the North Mariana Islands.

[10] One goal of this kind of prospective payment was to keep the process simple by limiting the groups of DRGs. There are now approximately 495 DRGs, up from 472 immediately following the introduction of the concept. An arbitrary maximum of 500 has been established. Note that some states may develop their own DRG system in which case the number of diagnosis groups may differ.

[11] See, for example, Custer, William S., James W. Moser, Robert A. Musacchio, and Richard J. Willke, "The Production of Health Care Services and Changing Hospital Reimbursement: The Role of Hospital-Medical Staff Relations.," Journal of Health Economics, Volume 9 (1990): 167-192

[12] Charles Helbing, "Chapter 4: Hospital Insurance Short-Stay Hospital Benefits," Health Care Financing Review/ 1992 Annual Supplement (1992): 55-96.

[13] For a more detailed description of terms refer to the Health Care Financing Review/ 1992, Annual supplement (1992) : 56 - 60.

[14] Susan Laudicina, "State Systems For Hospital Payment (prepared for the Prospective Payment Assesment Commission)," The George Washington University, April 1992.

[15] Robert E. Hurley and Deborah A. Freund, "A Typology of Medicaid Managed Care," Medical Care, 1988, Volume 26, Number 7, pp. 764-774.

[16] Hurley, Freund, and Paul, Managed Care in Medicaid. Lessons for Policy and Program Design, Health Administration Press, Ann Arbor Michigan, 1993.

[17] Regarding financial incentive structures, see, for example, Pauly, et al. (1990), Newhouse, et al. (1985), Luft (1978), and Manning, et al. (1984).

[18] Stephen Zuckerman, "Medicaid hospital spending: Effects of reimbursement and utilization control policies," Health Care Financing Review, Volume 9, Number 2, Winter 1987, pp.65-77

[19] See, for example, Leibowitz, et al. "A randomized trial to evaluate the effectiveness of a Medicaid HMO," Journal of Health Economics, 11 (1992): 235-257; Pauly, M.V., et al., "Managing Physician Incentives in Managed Care," Medical Care, Vol. 28, No.11, (November, 1990): 1013-1023; Newhouse, Joseph, et al., "Are Fee-for Service Costs Increasing Faster Than HMO Costs?" Medical Care, Vol. 23, No. 8, (August 1985): 961; Luft, Harold S., "How do Health-Maintenance Organizations Achieve Their 'Savings'"?, The New England Journal of Medicine, 298, (June 15, 1978): 1336-1343; and Manning, Willard G., et al., "A Controlled Trial of the Effect of a Prepaid Group Practice on Use of Services," The New England Journal of Medicine, June 7 (1984).

[20] The literature on this subject is extensive. See, for example Becker (1983), Feldstein and Melnick (1984), Feldstein (1990), Graddy (1991), Mueller (1986), Oster (1980), Peltzman (1976), Posner (1971), Stigler (1971), Wendling (1980).

[21] See for example: Larry L. Orr, "Income Transfers as a Public Good: An Application to AFDC," The American Economic Review, Vol. 66, No. 3 (June 1976): 359-371; or, Martcia Wade and Stacy Berg, "Causes of Medicaid Expenditure Growth," Health Care Financing Review, Spring 1995, Volume 16, Number 3, pp. 16.

[22] Gary S. Becker, "A Theory of Competition Among Pressure Groups For Political Influence," The Quarterly Journal of Economics., Vol. XCVIII, No. 3, August 1983. See also: Peltzman (1976), Posner (1971), and Stigler (1971).

[23] Paul J. Feldstein and Glenn Melnick, "Congressional Voting Behavior on Hospital Legislation: An Exploratory Study," Journal of Health Politics, Policy and Law, Volume 8, Number 4, Winter 1984, pp.686-701

[24] Leighton Ku and Teresa A. Coughlin, "Medicaid Disproportionate Share and Other Special Financing Programs," Health Care Financing Review, Volume 16, Number 3 (Spring 1995): 27-54

[25] Stephen Zuckerman, "Medicaid hospital spending: Effects of reimbursement and utilization control policies," Health Care Financing Review, Volume 9, Number 2, Winter 1987, pp.65-77

[26] Karl Kronebusch, "Medicaid and the Politics of Groups: Recipients, Providers, and Policy Making," Journal of Health Politics, Policy and Law, Volume 22, number 3, June 1997, pp. 846.

[27] T. W. Grannemann, "Reforming National Health Programs for the Poor," In Pauly, M.V. (ed.) National Health Insurance: What Now, What Later, What Never?, Washington, DC.: American Enterprise Institute, 1980, pp. 104-136. See also: Karl Kronebusch, "Medicaid and the Politics of groups: Recipients, Providers, and Policy Making," Journal of Health Politics, Policy and Law, Volume 22, Number 3, June 1997, pp. 850.

[28] See for example, Kenneth R. Cone and David Dranove, "Why did States Enact Hospital Rate-Setting Laws?," Journal of Law & Economics, Volume XXIX, 1986, pp.287-302

[29] See for example: (1) Robert D. Plotnick, "An interest group model of direct income redistribution," Review of Economics and Statistics (1986): 594-602. (2) Robert D. Plotnick, Richard F. Winters, "A Politico-Economic Theory of Income Redistribution," American Political Science Review, Volume 79(1985): 458-473. (3) Austin Ranney, "Parties in the American States" in Herbert Jacov and Kenneth Vines (eds.), Politics in the American States, Number 3 (1976): 51-92

[30] This study was performed in parallel with another which examined the variation in reimbursement of pharmaceutical drugs under Medicaid. For this first study three states were omitted for the following reasons: Arizona's Medicaid program was experimental for most of the study period and Alaska and Wyoming did not cover prescription drugs as a separate service to Medicaid recipients for the first half of the same period.

[31] J. Tobin, "Estimation of Relationships for Limited Dependent Variables," Econometrica, Volume 26 (1958): pp. 24-36.

SECTION III.VII: BIBLIOGRAPHY

Becker, Gary S. "A Theory of Competition Among Pressure Groups For Political Influence," The Quarterly Journal of Economics., Vol. XCVIII, No. 3, August 1983.

Cone, Kenneth R. and David Dranove, "Why did States Enact Hospital Rate-Setting Laws?," Journal of Law & Economics, Volume XXIX, 1986, pp.287-302

Custer, William S., James W. Moser, Robert A. Musacchio, and Richard J. Willke, "The Production of Health Care Services and Changing Hospital Reimbursement: The Role of Hospital-Medical Staff Relations.," Journal of Health Economics, Volume 9 (1990): 167-192

Dranove, David and Kenneth Cone, "Do State Rate Setting Regulations Really Lower Hospital Expenses," Journal of Health Economics, Number 4, 1985, pp.159-165.

Feldstein, Paul J. and Glenn Melnick, "Congressional Voting Behavior on Hospital Legislation: An Exploratory Study," Journal of Health Politics, Policy and Law, Volume 8, Number 4, Winter 1984, pp.686-701

Gurny, Paul, David K. Baugh, and Thomas W. Reilly, "Chapter 14: Payment, Administration, and Financing of the Medicaid Program," Health Care Financing Review/1992 Annual Supplement (1992): 285-302

Helbing, Charles, "Chapter 4: Hospital Insurance Short-Stay Hospital Benefits," Health Care Financing Review/ 1992 Annual Supplement (1992): 55-96.

Hurley Robert E. and Deborah A. Freund, "A Typology of Medicaid Managed Care," Medical Care, 1988, Volume 26, Number 7, pp. 764-774.

Hurley, Freund, and Paul, Managed Care in Medicaid. Lessons for Policy and Program Design, Health Administration Press, Ann Arbor Michigan, 1993.

Health Care Financing Grants and Contracts Reports, Health Care Financing Administration, Office of Research, Demonstrations, and Statistics, August 1980.

Kronebusch, Karl "Medicaid and the Politics of Groups: Recipients, Providers, and Policy Making," Journal of Health Politics, Policy and Law, Volume 22, number 3, June 1997, pp. 846.

Ku, Leighton and Teresa A. Coughlin, "Medicaid Disproportionate Share and Other Special Financing Programs," Health Care Financing Review, Volume 16, Number 3 (Spring 1995): 27-54

Laudicina, Susan, "State Systems For Hospital Payment (prepared for the Prospective Payment Assesment Commission)," The George Washington University, April 1989.

Leibowitz, Arleen, Joan L. Buchanan, and Joyce Mann, "A randomized trial to evaluate the effectiveness of a Medicaid HMO," Journal of Health Economics, 11 (1992): 235-257.

Luft, Harold S., "How do Health-Maintenance Organizations Achieve Their 'Savings'"?, The New England Journal of Medicine, 298, (June 15, 1978): 1336-1343

Manning, Willard G., et al., "A Controlled Trial of the Effect of a Prepaid Group Practice on Use of Services," The New England Journal of Medicine, June 7 (1984).

Newhouse, Joseph, et al., "Are Fee-for Service Costs Increasing Faster Than HMO Costs?" Medical Care, Vol. 23, No. 8, (August 1985): 961.

Orr, Larry L., "Income Transfers as a Public Good: An Application to AFDC," The American Economic Review, Vol. 66, No. 3 (June 1976): 359-371

Pauly, M.V., et al., "Managing Physician Incentives in Managed Care," Medical Care, Vol. 28, No.11, (November, 1990): 1013-1023

Plotnick, Robert D., "An interest group model of direct income redistribution," Review of Economics and Statistics (1986): 594-602

Plotnick, Robert D., Richard F. Winters, "A Politico-Economic Theory of Income Redistribution," American Political Science Review, Volume 79(1985): 458-473

Ranney, Austin, "Parties in the American States" in Herbert Jacov and Kenneth Vines (eds.), Politics in the American States, Number 3 (1976): 51-92

Salmon, J. Warren, H. Stephen Lieber, and Mary C. Ayesse, "Reducing Inpatient Hospital Costs: An Attempt at Medicaid Reform in Illinois," Journal of Health Politics, Policy and Law, Volume 13, Number 1, Spring 1988, pp.103-127.

Tobin, J. "Estimation of Relationships for Limited Dependent Variables," Econometrica, Volume 26 (1958): pp. 24-36.

U.S. Department of Health and Human Services, Health Care Financing Administration, Office of Managed Care. 1996 National Summary of State Medicaid Managed Care Programs.

Weisbrod, Burton A. "The Health Care Quadrilemma: An Essay on Technological Change, Insurance, Quality of Care, and Cost Containment," Journal of economic Literature, Vol. XXIX, (June 1991), pp. 523-552.

Zuckerman, Stephen "Medicaid hospital spending: Effects of reimbursement and utilization control policies," Health Care Financing Review, Volume 9, Number 2, Winter 1987, pp.65-77

CHAPTER IV

CONTROLLING MEDICAID INPATIENT HOSPITAL EXPENDITURES

SECTION IV.I: INTRODUCTION

Modern medicine and hospitals, along with physicians, are nearly synonymous in the minds of most Americans. Indeed, it is often difficult to imagine one without the other. Modern hospitals represent large concentrations of sophisticated medical technologies, highly specialized physicians, ancillary services, support personnel, and recovery rooms. Given this concentration, and the potentially lifesaving nature of the "goods" and "services" which are inherent to the health care industry, it is perhaps not surprising that hospital services claim a disproportionately large share of the nation's medical expenditures. Pertaining to the Medicaid program the inpatient hospital share of expenditures has traditionally been one of the largest, claiming approximately 25 to 30 percent of all outlays (see Figure 4.1).

Clearly, controlling hospital costs is crucial in the struggle to reduce the growth in the nation's health care budget. Regarding the Medicaid program, efforts to control costs have been shaped by the structure of the program. The Medicaid program is part of Title XIX of the Social Security Act of 1965. It is a joint Federal/state funded program which provides health care related services to the poor. To maintain a degree of equity, regarding the services provided, the Federal government provides some fundamental guidelines for state Medicaid agencies to follow. Within these guidelines, however, states have substantial flexibility. In particular, "each of the states:

1. establishes its own eligibility standards;
2. determines the type, amount, duration, and scope of services;

3. sets the rate of payment for services; and

4. administers its own program."[1]

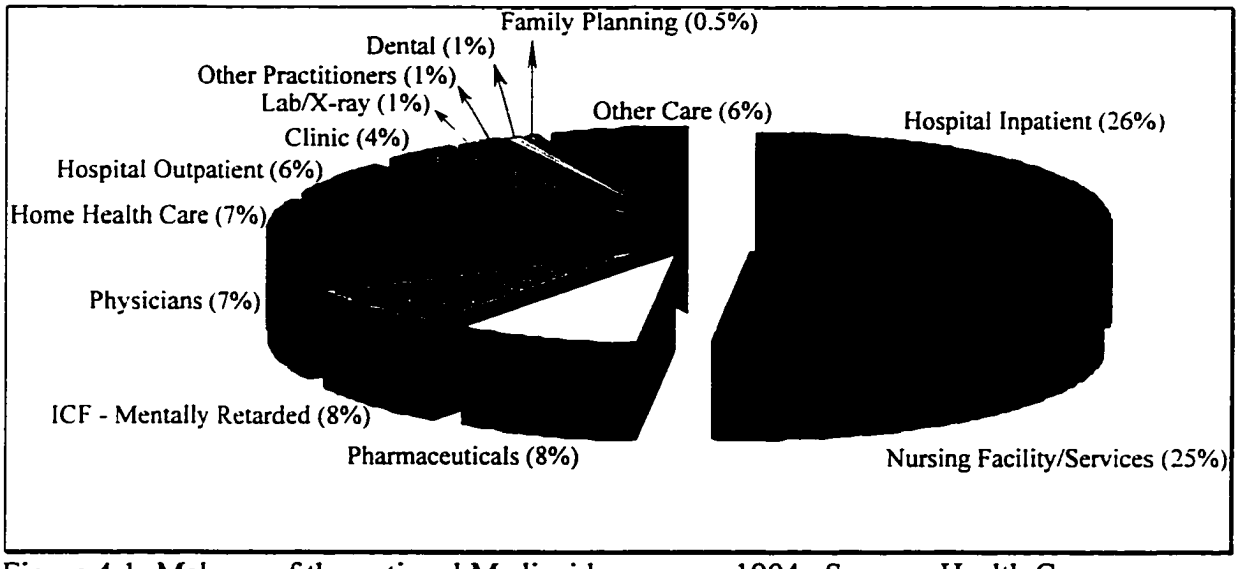


Figure 4.1: Makeup of the national Medicaid program, 1994. Source : Health Care Financing Administration, Form 2082.

This flexibility causes considerable variation among state Medicaid programs. Pertaining to services which are offered (point two), the state may influence expenditure levels by manipulating eligibility standards and payment rates (points one and three).[2]

The provision of inpatient hospital services is determined by numerous factors interacting in a complicated system of cause and effect. In compact notation

$$H_i = f(\mathbf{G}_i, \mathbf{X}_i) \tag{4.1}$$

where H_i is the level of Medicaid inpatient hospital expenditures in state "i", $\boldsymbol{G}_i$ represents a vector of government policy variables which are endogenously determined, and $\boldsymbol{X}_i$ is a vector of exogenously determined control factors. Within the context of inpatient hospital expenditures the policies which $\boldsymbol{G}_i$ is comprised of are:

a) Direct control over prices and utilization and, as a policy goal, costs. This type of policy became popular during the late 1970s and remains an essential tool today. In

particular, direct control can be exercised by the adoption of either prospective payment systems (PPS) or coverage limitations.

b) Market driven managed care. Although the notion of managed care existed since the beginning of the twentieth century it was not widely used by Medicaid agencies until the 1990s.[3] One important distinction between this approach and direct control is that States are attempting to capitalize on the financial incentive structures associated with prepaid health plans already developed in the private sector.

c) Indirect control through the manipulation of eligibility standards. This variable controls the size of the demand population and, consequently, expenditure levels.

In addition to G_i, equation (1) includes a vector, X_i, of exogenously determined factors. The variables in this vector may be grouped into the following categories: (1) supply side, (2) substitute and complementary services, (3) non-hospital cost control strategies, (4) demand and socioeconomic factors, (5) special interests, (6) federal policies.

Using a simultaneous equations approach, this paper examines the relative roles played by the policy choices. In particular, this paper compares the relative successes of the direct and the more market oriented cost control approaches. Figures two and three show the percentages of state Medicaid budgets devoted to inpatient hospital expenditures, indicating substantial variation both across states and over time. In 1986, for example, nine states had inpatient hospital expenditures claiming over 30 percent of their overall Medicaid budget. The number of states in this category declined to three in

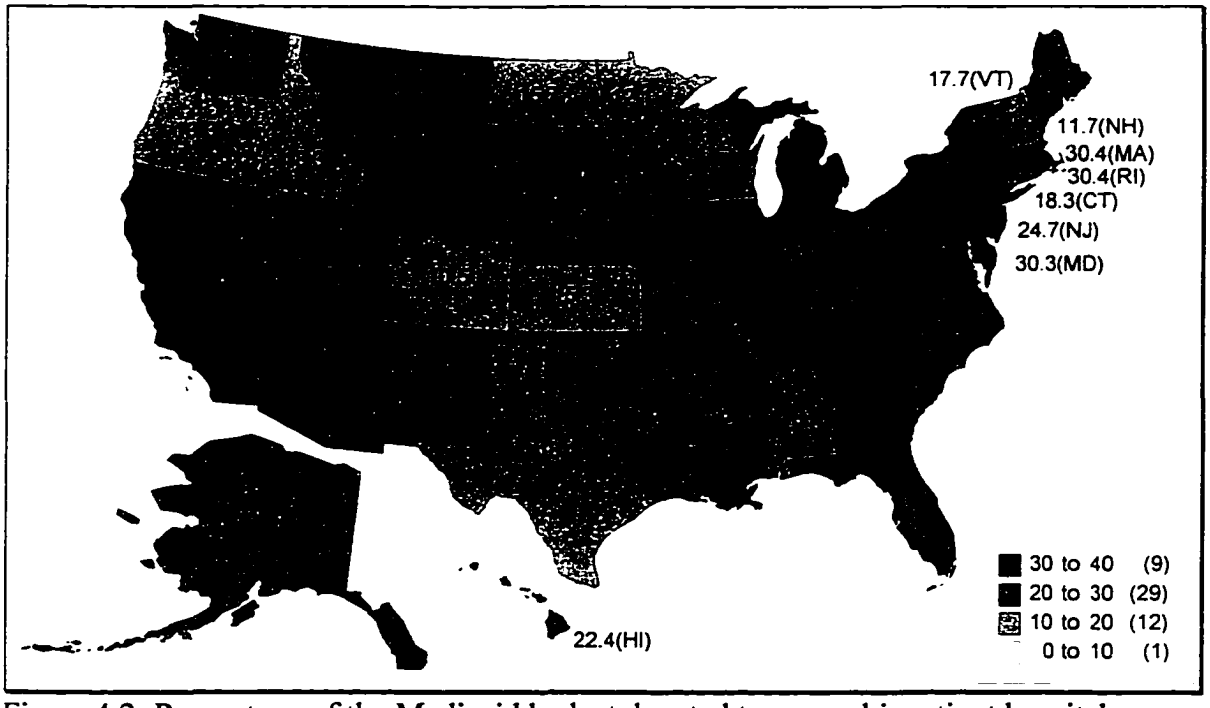


Figure 4.2: Percentage of the Medicaid budget devoted to general inpatient hospital expenditures, 1986. Source : Health Care Financing Administration, Form 2082.

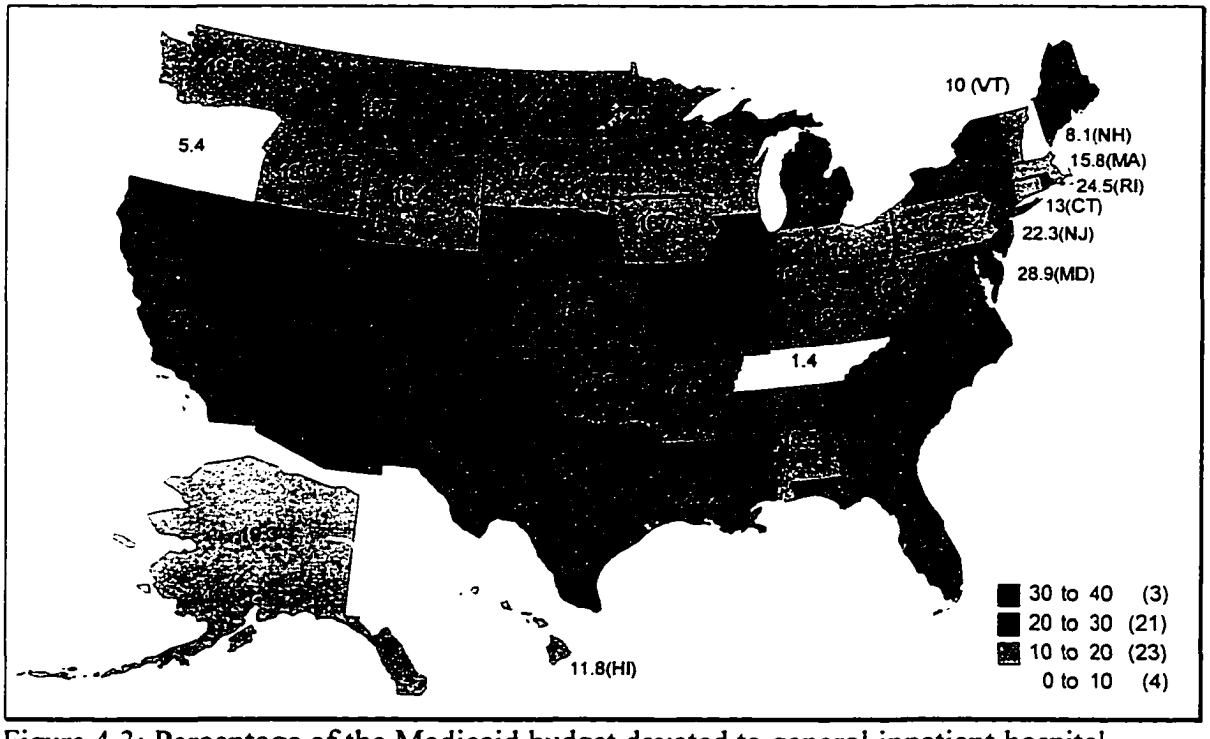


Figure 4.3: Percentage of the Medicaid budget devoted to general inpatient hospital expenditures, 1995. Source : Health Care Financing Administration, Form 2082.

1995, while the number of states with inpatient hospital expenditures in the 10 to 20 percent range almost doubled from 12 to 23 in that same time period. Section II discusses the theoretical framework of the model, followed by a description of the variables used in the empirical analysis in section III. Section IV describes the data, data sources, and empirical methods used, and sections V and VI provide the empirical results and a general discussion.

SECTION IV.II: THEORY

Direct Government And Market Driven Cost Containment Policies

Direct hospital cost controls

The inefficiencies inherent in the traditional FFS or "retrospective" provider reimbursement approach have been widely discussed in the literature.[4] Opponents of retrospective payment systems argue that it encourages, or, at least does not discourage, over utilization of services, since payment amounts are based on the incurred costs of the care provided. In addition to encouraging managed care principles, the passage of the Omnibus Budget Reconciliation Act (OBRA) of 1981 (Section 2173) has also led to a steady increase in the number of states adopting "prospective" payment systems (PPS).[5]

With prospective payment, reimbursement rates are determined prior to the delivery of services and are independent of the actual quantities of resources used. Hospitals delivering care at a cost below the predetermined payment level enjoy a profit. On the other hand, hospitals with costs exceeding the prospective payment level suffer a loss. PPS provides a powerful incentives for provider institutions to reduce the utilization of resources. Medicaid agencies introduced PPS to control costs by directly controlling prices.

There are three types of Medicaid PPSs: diagnosis related group (DRG) systems, rate-of-increase control systems, and negotiated systems. Use of a negotiated PPS is rare and will not be considered in this research; only the state of Delaware employed this method in 1992.[6] Under a rate-of-increase control system providers are paid a fixed rate, either per day or per case, generally based on the institutions' average costs, typically subject to a ceiling. Furthermore, adjustments for inflation are applied periodically. The third PPS has received the most attention in the literature, perhaps because it has been the method of reimbursement for Medicare short-stay hospital services since 1983.[7] This PPS is commonly known as a prospective case-mix system, according to which payment rates are based on patients' diagnoses. Each hospital inpatient is "grouped" according to a particular DRG which has an attached weighing factor determining the typical amounts of resources required for treatment. Multiplying an associated weighing factor by a predetermined rate yields the reimbursement rate to the provider.

In addition to PPSs designed to regulate prices and costs, some states impose direct controls on the utilization of hospital services. These direct utilization controls may take the form of

1. Limits on inpatient days per year implying a fixed maximum number of days which will be covered annually by Medicaid per recipient.
2. Limits on inpatient days per stay which may be fixed or varied according to the diagnosis.
3. Prior authorization in the case of non-emergency admissions. According to this policy hospitals will not be reimbursed for "discretionary" admissions for which no prior authorization was obtained from the Medicaid agency.

4. Prior authorization for specific services. This is similar to point three but applies only to certain elective procedures.

Medical care delivery strategies

Partly in response to steady post World War II increases in the share of the nation's wealth devoted to health care, prepaid health plans (PHP) have become increasingly popular. This approach's ability to generate savings over the FFS system in the private sector has been widely analyzed[8], and its use in Medicaid has recently gained momentum. Through the application of waivers OBRA 1981 encouraged states to adopt, among other cost-saving measures, PHPs with wide discretionary authority regarding their implementation.

A closely related concept, which encompasses PHPs, is Medicaid Primary Care Case Management (PCCM). Under this approach to managed care, a primary care provider is the patient's first point of contact into the system. This characteristic, by itself, is expected to generate savings.[9] Managed care is generally associated with more continuity in the delivery of care for individual patients, resulting in several desirable side effects, such as increased patient and provider satisfaction, improvements in patient attitudes, more expeditious and proficient recognition of medical problems, fewer laboratory tests and procedures, fewer illness visits, fewer emergency room visits, and potentially reduced inpatient use.[10]

Hurley, et al. (1993) distinguish between three types of Medicaid PCCM programs: (1) those which reimburse providers on a FFS basis; (2) those which utilize networks of physicians who are paid on a "capitated" or "financial-risk" basis; and (3)

those which enroll Medicaid enrollees in health maintenance organizations (HMOs). Intuitively, the second and third types have a greater ability to generate savings.

Control Variables

The supply of hospital services, substitutes and complements

Several theoretical models have been developed to explain the dynamics of hospital costs, generally focusing on not-for-profit institutions because of their prominence in the industry. Although they do not concentrate on the delivery of Medicaid hospital services, in particular, they do, to a large extent, provide insight into that segment of the industry as well. These models focus on the supply side of hospital services, the logistics of which are assumed to be identical whether the demand originates from a Medicaid or a non-Medicaid patient. When applied to Medicaid, however, the outcomes predicted by these models may be skewed to the extend that they assume out-of-pocket payments by patients. Medicaid recipients are generally fully covered by the program. Concerning the decision making process, particularly regarding the quantity and quality of services rendered, these models may be roughly divided into those which assume a larger degree of control either in the hands of an administrative body or the medical staff.

Millard Long (1964), Melvin W. Reder (1965), Joseph Newhouse (1970), Martin Feldstein (1971), and Maw Lin Lee (1971) are examples of the former, assuming somewhat similar objective functions and constraints for hospitals. Long, for example, discusses a model in which hospitals attempt to maximize quantity, referred to as the guiding principle of their behavior, subject to a budget and quality constraint. Reder describes the hospitals' goal as achieving a careful balance between the availability of

resources, such as beds, and the number of patients admitted. Newhouse and Feldstein explore a model in which the objective function contains both the quality and quantity of care, which are maximized subject to a budget constraint. In Lee's approach the hospital administration attempts to maximize a general utility function, containing such variables as salary, prestige, security, power, and professional satisfaction. In addition he also considers types of physical capital in the objective function.

On the other hand, Reder (1965) also points out that physicians, as managers of the production of health care services, have substantial influence regarding the demand for, and the supply of, hospital services. Using this notion as a starting point, Mark Pauly and Michael Redisch (1973), and Jeffrey Harris (1974) emphasize the decision making role which physicians fulfill concerning the day to day operations of a hospital. Pauly and Redish assume that hospital affiliated physicians enjoy control over hospital facilities at any point in time. In this framework, physicians can enhance the quality of their product by combining it with hospital services. In his description of the "split" organizational structure of hospitals, Harris points to the necessity of "decentralized" decision making. The physician acts as an agent who decides which patients are admitted, how long they will stay, and what inputs they will receive.

Supply side factors, therefore, are essential in determining the level of inpatient hospital expenditures under Medicaid, or any other payment program. As numerous authors have pointed out, one of a hospital's goals is to minimize the number of empty beds. Furthermore, the role of physicians, particularly hospital affiliated, is to complement their services with those encountered in a hospital. On the other hand, as was empirically investigated by Miller (1988), office based physicians' services and

outpatient hospital services, for example, may act as substitutes for inpatient hospital services.

Demand and socioeconomic factors

Health is perceived of as a durable good, or a type of capital, from which individuals enjoy a flow of services. According to this notion, developed by Michael Grossman (1972), this flow of services is consumed by individuals during their lifetimes.[11] Each individual is born with an initial endowment of a stock of health, which is subject to depreciation and augmentation. Depreciation may stem from such factors as aging or incidences of illness. Augmentation may originate from a healthy lifestyle or an investment in medical services. Thus, starting with an endowment at the beginning of a given period, say a year, people can augment their stock of health. The demand for medical services is, therefore, interpreted as derived from the demand for health. The second set of variables that effect expenditure levels are related to the demand side of the industry. Aside from the size of the population the demand for health, and therefore the demand for medical services, varies with specific socioeconomic factors, such as sex and age.

Interest groups

Legislation regarding the Medicaid program, particularly concerning matters of reimbursement levels and methodologies, are important determinants of inpatient hospital expenditures. Legislative outcomes have been explained as outcomes of a function containing public interest and special interest factors. The former claims that interventions in industries result largely from the public's demand for legislative action. Alternatively, the economic theory of special interests argues that legislation is demanded

by groups with related interests.[12, 13, 14, 15] Groups which would benefit, or lose, from particular legislation have an incentive to exercise their influence in the decision making process. Hospitals and physician interests, for example, will be affected directly by legislation regarding reimbursement methods or the freedom to recommend and provide the treatment deemed most appropriate for an individual patient. Clearly, any analysis of Medicaid hospital expenditures must account for the impact of the interaction between these groups and the legislative process.

Federal policy

The Medicaid program is a joint federal/state program which provides medical care to the nation's poor. At its creation the federal government established a minimum level of services, both mandatory and optional, which must be covered under state run programs.[16] The argument for federal control was to ensure some equality regarding the medical treatment of the poor. Within this framework the federal government has continued to affect the scope of the program, for example through changes in eligibility requirements which are passed down to the states.

SECTION IV.III: MODEL VARIABLES

Hospital cost containment policies consist of prospective payment methods, utilization controls, and managed care enrollment. A detailed discussion of these variables is presented in the preceding essay "Alternative Reimbursement Methods And Medicaid Hospital Expenditures." The decision to adopt cost containment policies is treated as endogenous. States which experience budget pressures, perhaps due to high Medicaid expenditures may be more likely to adopt cost containment measures. If this is the case, the results may incorrectly indicate a positive relationship, for example,

between the use of PPS and inpatient hospital expenditure levels. Furthermore, the presence of special interests and the preferences of the median voter are likely to affect the support for such alternative systems. It is, therefore, clear that the enactment of a PPS should be treated as endogenous.[17] By treating the decision as endogenous the effects of the latent factors which determine whether a state adopts a PPS are entered into the model.

Industry supply, substitute, and complementary characteristics

- **Per capita hospital beds.** This variable provides a measure of hospitals' capacity and, albeit crudely, the probable availability of facilities. States with high beds to population ratios are more likely to have excess capacity. Affected hospitals would, presumably, have more relaxed policies regarding the admittance of Medicaid patients. A significant positive relationship between available hospital beds and expenditure levels may indicate evidence for the induced demand hypothesis, according to which providers can stimulate demand to minimize excess capacity or to increase income.[18] Per capita beds, as opposed to the total number of beds, is used because of severe multicollinearity between the latter and the number of Medicaid recipients in the state. The per capita beds variable is defined as

$$\text{per capita beds} = \frac{\text{hospital beds } (\times 1000)}{\text{state population}}.$$

- **Hospital based physicians in patient care.** This sub-set of physicians has easy access to hospital services at any point in time to complement and enhance the quality of their own product. Thus, the larger the percentage of hospital based physicians, the more hospital services will be used and the higher expenditure levels will be.

- **Office based primary care physicians in patient care**. A separate measure for private (non hospital based) physicians, particularly the percentage of physicians who are general practitioners, is included to account for the differences regarding their interaction with hospital facilities. The services provided by this subset of physicians are hypothesized to be substitutes to inpatient hospital services. Surgeons and other hospital based physicians are more likely than general practitioners, who are usually more independent and versatile, to induce increased inpatient hospital care.[19] An increase in the supply of, and, consequently access to office based general practitioners' services should, ceteris paribus, reduce utilization of inpatient hospital services.
- **Medicaid physician, outpatient hospital, and other services**. Different Medicaid services are not provided independently of one another. Since Medicaid recipients generally do not have any out-of-pocket expenses, they will likely seek the most effective and comprehensive type of care as their first choice. If the first-choice service becomes restricted due to federal or state policies, demand for such services will likely be diverted to substitute services. Regarding inpatient hospital services, for example, the empirical literature has demonstrated a complementary relationship with physician, outpatient hospital, and clinic services.[20] In an analysis examining the interaction between physician and inpatient services in the Medicare system, Miller et al., 1997 find that this relationship is particularly strong from physician to hospital services, while a weaker relationship exists in the opposite direction.[21]

In addition to the general supply side substitute and complementary factors employed in the model, several non-hospital cost containment variables are tested as

well. Successful policies which are designed to reduce utilization of substitute and complementary services should have, respectively, positive or negative impacts on inpatient hospital use. Observe that these policies are treated as exogenous with respect to inpatient hospital expenditures even though their enactment is determined by individual state Medicaid agencies. The following non-hospital cost containment control policies are included; if the state

1. has limits on the coverage of outpatient hospital services.
2. uses Medicare principles, or prospective payment, for the reimbursement of outpatient hospital services.
3. has limits on the coverage of skilled nursing facility services.
4. has limits on mentally retarded intermediate care facility services.
5. has limits on physicians' inpatient hospital visits.
6. requires prior authorization for certain physician services.
7. uses Medicare principles to reimburse physician services.

Demand and socioeconomic variables

- **Recipients.** States have wide discretion regarding the eligibility requirements which individuals must meet to qualify for Medicaid covered benefits. As such, states may use this source of control to limit or expand the eligible population, and, consequently, the recipient population, depending on the fiscal context. The number of recipients in any particular year is, therefore, assumed to be endogenously determined.[22]
- **Acquired Immunodeficiency Syndrome (AIDS).** Since it was first recognized in 1981, the number of cases of the most severe form of the Human Immunodeficiency

Virus (HIV), AIDS, increased steadily throughout the 1980s and most of the first half of the 1990s. The treatment of this deadly disease is relatively expensive, with estimates of lifetime medical care costs ranging from a low of $38,000[23, 24] to a high of approximately $147,000.[25]

The incidence of this disease has three potentially important implications pertaining to Medicaid inpatient hospital expenditure levels and the variations in those expenditures across states. First, the Health Care Financing Administration (HCFA) estimates the proportion of AIDS patients who depend on Medicaid for their medical needs to be approximately 40 percent. This relatively high percentage is not likely to decline considering that the disease's victims are generally poor, lack private insurance, and are too young to qualify for Medicare. Second, relating to variations between states, AIDS cases are relatively concentrated in only a few states. Approximately 35 percent of all reported cases in 1994 are from California and New York alone. This percentage rises to 60 percent when the next three states with the highest number of reported cases, Florida, Texas, and New Jersey are included.[26] Third, providing that an AIDS patient meets the eligibility criteria of a particular state, inpatient hospital services may be most accessible given that their coverage is mandatory under Medicaid. Other services which are important to AIDS patients, but are often restricted or not available, include prescription drugs, community health services, dental services, and personal care services.[27] Such services, if available, could act as substitutes for inpatient hospital services. To account for the impact of this disease on state expenditures, a dummy variable was constructed to represent these five states.

- **Percentage female.** A large proportion of hospitalizations under Medicaid involve pregnancies, especially following OBRA 1986 and 1987 (see discussion concerning eligibility expansions in the federal policy section below). To account for this, the percentage of eligibles who are female is included in the model. A positive relationship is expected between this variable and inpatient expenditures.
- **Family size.** The care of a family member may not be a perfect substitute compared to that received from a medical professional, but it is personal, generally punctual, and associated with lower time costs. Furthermore, the cost of child care during hospital visits increases with the number of dependent children in the family. Leibowitz, et al. tested this hypothesis and found that eligibles belonging to families of size three or larger tend to use less care.[28] Given the absence of this data at the state level, the impact of family size is approximated by the average size of households in the states. A negative relationship is expected.
- **Percent metropolitan population.** To control for any differences in demand for services which may exist between urban and rural areas, the percentage of the states' population living in metropolitan areas is included in the model. There are two important reasons why hospital expenditures are expected to be higher in urban versus rural areas. First, urban institutions generally maintain more technologically advanced equipment and, therefore, on average attract more medically demanding patients. Second, hospitals, and therefore, hospital services are generally more plentiful in urban areas, reducing recipients' time costs. This will likely result in higher utilization rates in metropolitan areas. However, to the extend that alternative forms of care, particularly ambulatory care, are more accessible in metropolitan areas

than in more sparsely populated regions, a substitution effect toward such alternatives may reduce inpatient hospital expenditures. The net effect of these factors is expected to be positive.

- **Percentage of population age 65 and over.** Individuals that reach the age of 65 are automatically covered by Medicare. To account for the effects of Medicaid recipients transferring between public health programs, the percentage of the population over the age of 65 is included in the analysis.

Interest groups

Hospitals are expected to oppose any legislation directed towards limiting reimbursements for inpatient services. The influence of hospitals is represented in this model as a supply side factor by per capita hospital beds (defined above). Spending or hospital revenue caps, for example, would impair hospitals' ability to expand and increase their services, and may even result in financial difficulties. The special interest undertones of this variable reinforces the expectations of a positive correlation with expenditure levels.

In addition to hospitals, physicians have been identified as having a direct interest in matters which affect inpatient expenditure levels. Inadequate payments for Medicaid patients, restricting hospitals' ability to hire additional personnel or implement new technologies and facilities, would also diminish physicians' productivity. Physicians are, therefore, expected to favor higher payments for Medicaid hospital patients. In addition to the percentage of hospital based and general practice physician variables defined above, the percentage membership of the American Medical Association in each state is used to account for a more direct political influence. Because only a small percentage of

physicians treat a large number of Medicaid patients, this variable is not expected to have a large impact on hospital expenditures.

Federal policy variables

- **Eligibility expansions.** During the latter half of the 1980s state and federal governments made several changes in legislation, severing the traditional link between AFDC and Medicaid eligibility. Most notably were provisions in OBRA 1986 and 1987 which were directed at enhancing care for pregnant women and infants. Realizing the long term health and financial benefits of proper, early, and regular prenatal care, both the individual states and the federal government initiated campaigns to encourage pregnant women to seek eligibility. Furthermore, efforts were made to recruit and retain medical providers, particularly obstetricians.[29] Starting in 1988 these policies resulted in substantially increased annual recipient growth rates among pregnant women and children.[30] To account for these policies a dummy variable to indicate years starting with 1988 will be included in the model.
- **The Medicaid Voluntary Contribution and Provider Specific Tax Amendments of 1991.** Originating out of 1981 legislation, and encouraged by Congress and the HCFA between 1985 and 1988, Disproportionate Share Hospital (DSH) payments were designed to help public and non-profit hospitals which serve a proportionately high number of Medicaid and uncompensated care patients. The high proportion of such patients prevents these hospitals from shifting costs to private pay patients as their counterparts are capable of doing.[31,32] However, DSH payments quickly became entangled in special revenue enhancing schemes which were designed to raise federal

funds for state Medicaid programs without appreciable increases in "real" state contributions.

For example, West Virginia and Florida were among the first states to establish provider specific tax and voluntary donation programs (T&D). Under these programs the state taxes providers or receives voluntary donations from providers, which are typically returned as increased reimbursement Medicaid payments. These payments are, subsequently, matched by the federal government based on the Federal Medicaid Assistance Percentage (FMAP).[33]

An alternative method used to increase revenues from the federal government involves Inter-Governmental Transfers (IGT). Similar to T&Ds, IGTs are taxes from local governments or hospitals which are transferred to the Medicaid agency. These taxes are then used as payments to contributing institutions, for example as a DSH payment. Again, these payments must then be matched by the federal government based on the FMAP,[34] effectively shifting the financial burden to other states. Consider a state whose share of Medicaid expenses is 50 percent[35]. Suppose the state collects $50 million from an imaginary medical institution and returns a Medicaid reimbursement payment of $60 million. The state, consequently, receives $30 million in FMAP payments, which translates into a $20 million net gain, while the institution enjoys an increase in funds of $10 million. The federal government suffers a $30 million cost, which is, consequently, dispersed among all 50 states. This net gain can be used to maintain or enhance current programs in the state. It must be noted that these special financing practices result in an unfortunate side effect of artificially inflating inpatient hospital expenditure measures. In the example above, the state

would report an increase in hospital expenditures of $60 million, whereas the true increase is only $10 million.

The Medicaid Voluntary Contribution and Provider Specific Tax Amendments, which are aimed at reducing states' ability to acquire federal funds, are represented by a dummy variable with a value of one starting with 1992. The amendments limit the federal matching payments on funds acquired from T&Ds by

1. "essentially banning provider donations.
2. Capping provider taxes so that provider tax revenues could not exceed 25 percent of the state's share of Medicaid expenditures.
3. Imposing provider tax criteria so that taxes were 'broad-based' and providers were not 'held harmless.'
4. Capping State DSH payments at roughly their 1992 levels."[36]

A weakness of the amendment is that it concentrates on T&Ds but largely ignored IGTs. Nonetheless, it is expected to reduce hospital expenditures.

SECTION IV.IV: DATA AND ESTIMATION

The data consists of a cross section of 47 states and a time series of 12 years (1985 to 1996).[37] A large part of the data was obtained from annual publications of HCFA forms 2082 (recipient) and 64 (financial), and from the agency's Internet site. Socioeconomic data was acquired from the Statistical Abstract of the United States. Other significant sources include Medical, Practice Data by Census Division, State, and County Group by the American Medical Association, Pharmaceutical Benefits Under State Medical Assistance Programs by the National Pharmaceutical Council, EBRI

Databook on Employee Benefits by the Employee Benefit Research Institute, and data on unions collected by Professor Barry Hirsch at Florida State University.

To maintain adequate degrees of freedom, missing observations for the number of physicians for three years (1988, 1991, and 1995) were extrapolated by using the averages of adjacent years. A similar procedure was used to extrapolate data regarding the percentage of individuals in poverty, the percentage of the population which lives in metropolitan areas, and the average payments made to AFDC families for 1996. Given that the distributions of these variables across states do not exhibit significant variation from year to year, extrapolation should not affect the results.

Also, the data for the rate-of-increase control dummy endogenous variable was not completely acquired. Values prior to 1988 and after 1994 were extrapolated under the assumption that 1988 and 1994 values were representative of previous and following years. Furthermore, the results concern the latent factors which lead to the adoption of this policy. These factors were likely to be present some years before and after the implementation of a related policy.

Equation (1) presented a general equation of inpatient hospital expenditures as:

$$H_t = f(\mathbf{G}_t, \mathbf{X}_t) \tag{4.2}$$

where G_i and X_i represent vectors of endogenously and exogenously determined variables, respectively. The vector G_i includes five latent endogenous variables, defined as the cost-containment sentiment in the state. As a result of the influence of these latent variables one observes the following: (1) whether a state has adopted a DRG based PPS; (2) whether a state has adopted a rate-of-increase control based PPS; (3) whether a state employs inpatient hospital utilization control policies; (4) the percentage of enrollees in

managed care; and (5) the number of recipients in the state. Thus, the full model consists of six equations:

$$y_1 = y_2^{\bullet}\gamma_{21} + y_3^{\bullet}\gamma_{31} + y_4^{\bullet}\gamma_{41} + y_5^{\bullet}\gamma_{51} + y_6\gamma_{61} + X_1\beta_1 + \varepsilon_1 \tag{4.3a}$$

$$y_2^{\bullet} = X_2\beta_2 + \varepsilon_2 \qquad y_2 = \begin{cases} 1 & \text{if } y_2^{\bullet} > 0 \\ 0 & \text{otherwise} \end{cases} \tag{4.3b}$$

$$y_3^{\bullet} = X_3\beta_3 + \varepsilon_3 \qquad y_3 = \begin{cases} 1 & \text{if } y_3^{\bullet} > 0 \\ 0 & \text{otherwise} \end{cases} \tag{4.3c}$$

$$y_4^{\bullet} = X_4\beta_4 + \varepsilon_4 \qquad y_4 = \begin{cases} 1 & \text{if } y_4^{\bullet} > 0 \\ 0 & \text{otherwise} \end{cases} \tag{4.3d}$$

$$y_5^{\bullet} = X_5\beta_5 + \varepsilon_5 \qquad y_5 = \begin{cases} y_5^{\bullet} & \text{if } y_5^{\bullet} > 0 \\ 0 & \text{if } y_5^{\bullet} \le 0 \end{cases} \tag{4.3e}$$

$$y_6 = X_6\beta_6 + \varepsilon_6 \tag{4.3f}$$

Where, y_1 is inpatient hospital expenditures, y_2 indicates whether the state uses of a DRG based PPS, y_3 indicates whether the state uses a rate-of-increase control PPS, y_4 indicates the use of direct cost containment policies, y_5 is the percentage of recipients enrolled in managed care, and y_6 represents the number of Medicaid recipients. The "starred" variables represent the latent factors which yield the values of their "non-starred" counterparts. The X_i represent $(N \times K_i)$ matrices of the exogenous variables of each equation, the β_i are $(K_i \times 1)$ vectors of unknown parameters associated with the exogenous variables, the γ_i are scalar unknown parameters associated with the endogenous variables, and the ε_i are the error terms.

To estimate the parameters of this simultaneous equations system, which includes continuous, dichotomous, and censored endogenous variables, a two stage estimator is

employed. Using the Probit estimator for equations (3b), (3c), and (3d), the probabilities that $y_2 = 1$, $y_3 = 1$, and $y_4 = 1$ are estimated to generate instruments to be used in equation (3a). Similarly, the predicted number of recipients (equation 3f) is used as an instrument for y_6. The predicted values of the percentages of enrollees in overall and capitated managed care was obtained through a Tobit estimator.[38] Since a state will have managed care enrollees only if it has a Medicaid managed care program, the distribution of this variable is necessarily censored, implying that OLS estimates would neither be consistent nor efficient.

Considering the combination of continuous, dichotomous, and censored dependent variables in the model, the distribution of the estimator is unknown. The conventional standard errors could therefore not be used to make inferences. The bootstrap method described in Appendix B was used to reduce the bias and provide more reliable standard errors.[39]

Unfortunately, the study period had to be divided into two parts since data on two important variables, particularly managed care enrollment and the sex of Medicaid recipients, is not available for years prior to 1991. Furthermore, F-tests for structural breaks, using the remaining variables, indicate a changing parameter vector around that time period. A dummy variable model indicated that the structural break is not system wide, but is, in fact, limited to only a few variables. The sensitivity of the coefficients is tested by estimating the model for several time periods, 1985 to 1996, 1985 to 1990, and 1991 to 1996. The 1991 to 1996 model was estimated separately with two different specifications of the managed care variable: overall enrollment and enrollment in capitated plans.

SECTION IV.V: EMPIRICAL RESULTS

Table 4.1 contains the results of the regressions. Each column corresponds to a different regression, either based on the time period or included variables:

A. Time period 1991 to 1996, executed with managed care variable "overall managed care enrollment."

B. Same time period as regression A, but, using managed care variable "enrollment in capitated managed care," to test the hypothesis that risk based plans produce larger savings.

C. Time period 1985 to 1996. This regression, using the full period, was executed to examine the long term effects of the variables. Most variables are not affected by the structural break; therefore associated coefficients keep their traditional interpretation.

D. Time period 1985 to 1991. This regression was executed to examine the sensitivity of the coefficients over time.

The Impact Of Endogenous Policy Variables

Managed care

States with higher percentages of their Medicaid population enrolled in managed care programs have significantly lower inpatient hospital expenditures. Both managed care variables are significant. Surprisingly, the coefficient on capitated enrollment is only slightly higher, although much more significant as indicated by the associated t-statistic. The first specification included FFS-based managed care which relies on enhanced continuity of care to generate long-term savings. Note, however, that Medicaid recipients generally remain eligible to receive care covered by the program for an average of only a

few months to a year. Eligibility for Medicaid tends to be transitory, a characteristic which does not complement the objective of enhanced continuity of care.[40]

Table 4.1: Regression results.

Constant	**18.0784** (15.3986)	**18.8558** (23.1741)	**19.0120** (52.2809)	**18.3901** (32.4670)
Overall managed care enrollment	**-0.0042** (-2.3452)			
Capitated managed care enrollment		**-0.0045** (-5.3725)		
Prospective payment system based on DRGs	-0.1083 (-1.4955)	**-0.2353** (-5.2145)	**-0.1643** (-7.8675)	**-0.1386** (-5.1276)
Prospective payment system based on rate-of-increase control	-0.1158 (-1.0958)	**-0.2069** (-3.1199)	**-0.1838** (-4.5645)	-0.0874 (-1.3336)
Coverage limitations	-0.0583 (-0.9737)	0.0398 (0.8383)	**-0.0997** (-2.5766)	**-0.1948** (-4.8171)
Per capita hospital beds	0.0681 (1.3748)	0.0188 (0.5273)	**0.1438** (8.8555)	**0.2152** (7.8452)
Percentage of office based general practitioners	**-0.5495** (-7.1002)	**-0.5835** (-11.1517)	**-0.4692** (-17.0698)	**-0.4769** (-12.3760)
Percentage of hospital based physicians	**0.0258** (3.4802)	**0.0278** (35.4813)	**0.0256** (8.8057)	**0.0183** (3.6090)
Medicaid recipients	**0.0006** (11.5396)	**0.0006** (17.6535)	**0.0008** (27.3651)	**0.0009** (20.7193)
Reported AIDS cases dummy	**0.3651** (2.6681)	**0.3988** (4.2722)	**0.3286** (5.5494)	**0.2137** (2.5756)
Percentage of female recipients	1.9090 (1.7084)	1.3628 (1.7496)		
Average family size	**-0.8743** (-2.8403)	**-0.9497** (-4.5903)	**-0.7099** (-6.1631)	**-0.5695** (-3.1769)
Percentage metropolitan population	0.0035 (1.1240)	**0.0041** (1.9299)	**0.0043** (3.7044)	0.0037 (1.2660)
Percentage AMA membership	0.0010 (0.3249)	-0.0004 (-0.2547)	-0.0005 (-0.4231)	-0.0012 (-0.6049)
Percentage of the population age 65 and older	-0.0097 (-0.6395)	-0.0086 (-0.8347)	**-0.0344** (-8.2067)	**-0.0359** (-6.3622)
OBRA 1987			-0.0653 (-1.8141)	-0.0377 (-1.3765)
Vol. contribution & provider specific tax amendments of 1991	-0.0679 (-0.8033)	**-0.1926** (-3.8908)	**-0.2236** (-6.9622)	
Physician co-payment	**(0.2856) 2.3837**	**0.2931** (3.6771)	**0.3912** (9.0967)	**0.3871** (7.2257)
Coverage limits on skilled nursing facility services	**(0.5335) 2.0429**	**0.5212** (2.9334)	**0.1794** (3.4273)	**0.2039** (3.6384)
Coverage limits on intermediate care facility services	**(0.2476) 2.4516**	**0.2150** (3.1522)	**0.1639** (4.4032)	0.0559 (0.3111)

t-values are in parentheses. Estimates which are significant at the five percent level are in boldfaced print. (Table Con'd.)

Table 4.1: Continued

Limits on physician enrollment	(-0.3459) -4.1527	-0.2986 (-5.0913)	-0.1988 (-6.2477)	-0.1080 (-2.0714)
Prior authorization on certain physician services	(-0.0055) -0.0663	-0.0085 (-0.1503)	0.1235 (4.0659)	0.1466 (3.8596)
Prospective payment on physician services	(0.0039) 0.0374	0.0639 (1.0530)	-0.0370 (-1.0435)	-0.0286 (-0.7452)
Coverage limits on outpatient hospital services	(0.2141) 2.7225	0.2149 (4.0447)	0.2454 (4.0659)	0.2006 (3.8328)
Prospective payment on outpatient hospital services	(-0.0621) -0.7985	-0.1083 (-2.0143)	-0.0366 (-1.0435)	-0.0288 (-0.2908)

DRG based PPS

States which have implemented a DRG based PPS generally also have significantly lower inpatient hospital expenditures. In equation A, which employs the overall specification of managed care enrollment, the estimated coefficient remains negative but is statistically insignificant. The decrease in significance is likely the result of the collinearity between overall managed care enrollment and the use of DRG and rate-of-increase control PPSs, making it statistically difficult to separate the individual impacts of these variables. Because of this more weight is given to the estimates from the second equation.

Rate-of-increase control based PPS

A similar pattern in the significance of the estimated coefficients is found between the DRG and rate-of-increase control based PPS variables. Again, the collinearity between these variables and overall managed care enrollment is suspected to be the cause. There is also an interesting pattern in the absolute sizes of the coefficients of the PPS variables over time. Comparing the coefficients associated with DRG and rate-of-increase control variables between equations D, C, and B, a clear upward trend is

apparent. This provides evidence that larger savings are achieved as alternative reimbursement programs mature.

Coverage limitations

The estimated coefficients associated this variable indicate that states which imposed coverage limitations enjoyed significantly lower expenditures only before 1991 (equations C and D). The lack of significance in the 1991-1996 equations is due to the limited variation in this variable across states during this period. As indicated in Table 4.2, most states have employed coverage limitations in the 1990s, causing this variable to be highly correlated with the constant term. Based on the 1985-1990 equation we conclude that coverage limitations do significantly lower inpatient hospital expenditures.

The Impact Of The Control Variables

The supply of hospital services, substitutes, and complements

The predicted effect of the per capita hospital beds, measuring availability, is significant only in regressions C and D. This provides limited evidence for the supplier induced demand hypothesis. The estimated coefficients for the percentage of office based general practitioners and the percentage of hospital based physicians indicate, respectively, substitute and a complementary relationships with hospital services. States which have a higher percentage of general practitioners enjoy lower hospital expenditures, and, most likely lower overall medical outlays considering the lower cost associated with office based care.

Besides office based physician services, the estimates also indicate a substitute relationship between inpatient hospital services and skilled nursing facility services, intermediate care services, certain physician services, and hospital outpatient services.

States which limit the coverage of these services have higher inpatient hospital expenditures, indicating that the excess demand created by these policies is diverted to the hospital component. On the other hand, as expected, a complementary relationship exists between inpatient hospital services and physician inpatient hospital services.

Table 4.2: States which utilized a prospective payment system in 1994.

Alabama	.	.	Yes
Arkansas	.	Yes	Yes
California	.	Yes	Yes
Colorado *	Yes	Yes	Yes
Connecticut	.	.	Yes
Delaware	.	Yes	.
Florida	.	Yes	Yes
Georgia	.	Yes	.
Hawaii	.	Yes	Yes
Iowa	Yes	.	Yes
Idaho	.	.	Yes
Illinois *	Yes	Yes	Yes
Indiana	Yes	.	.
Kansas	Yes	.	Yes
Kentucky	.	Yes	Yes
Louisiana	.	Yes	Yes
Massachusetts	.	Yes	Yes
Maryland	.	.	Yes
Maine	.	.	Yes
Michigan *	Yes	Yes	Yes
Minnesota	Yes	.	.
Missouri	.	Yes	Yes
Mississippi	.	Yes	Yes
Montana	Yes	.	.
North Carolina	.	.	Yes
North Dakota	Yes	.	.
Nebraska	.	Yes	Yes
New Hampshire*	Yes	Yes	Yes
New Jersey	Yes	.	Yes
New Mexico *	Yes	Yes	Yes
Nevada	.	.	Yes
New York *	Yes	Yes	Yes

Source: Health Care Financing Administration spDATA System.
*States which utilize both a DRG based and a rate of increase control approach. In this year there were 39 PPS states, 10 of which used both approaches. (Table Con'd.)

Table 4.2: Continued

Ohio *	Yes	Yes	Yes
Oklahoma	.	Yes	Yes
Oregon	Yes	.	Yes
Pennsylvania	Yes	.	Yes
Rhode Island	.	Yes	.
South Carolina*	Yes	Yes	.
South Dakota	Yes	.	.
Tennessee	.	Yes	Yes
Texas	Yes	.	Yes
Utah *	Yes	Yes	Yes
Virginia	.	Yes	Yes
Vermont	.	Yes	.
Washington	Yes	.	Yes
Wisconsin *	Yes	Yes	.
West Virginia	.	.	Yes

Demand and socioeconomic factors

The demand and socioeconomic variables all have the predicted impacts. The predicted number of recipients has an expected strong positive impact on expenditure levels; states with a large number of reported AIDS cases have significantly higher inpatient hospital expenditures; the percentage of female recipients, although generally not significant at the 5 percent level, is associated with higher expenditures; states with higher average households have lower expenditures; and, larger metropolitan populations are associated with higher expenditures for hospital services. Also, as the percentage of the population over the age of 65 increases, indicating a shift from Medicaid to Medicare, expenditure levels under the former program fall.

Federal policies

Concerning federal policies, the Voluntary Contribution and Provider Specific Tax Amendments of 1991 are associated with lower inpatient hospital expenditures. These amendments essentially discouraged the use of special revenue enhancing

strategies, which some states used to increase the flow of federal funds for their Medicaid programs. The results indicate that the amendments were successful. On the other hand, the OBRA 1987 dummy variable was neither significant nor did it have the expected positive influence on expenditure levels. This may be because of the presence of the recipients variable.

SECTION IV.VI: DISCUSSION AND POLICY IMPLICATIONS

Regarding cost control, the results indicate that states have a variety of effective options in their arsenal. Capitated managed care and prospective payment systems, including both DRG and rate-of-increase systems, are all associated with reduced inpatient hospital expenditures. Using the estimated coefficients from regression B, approximate annual savings were calculated.[41] On average, States which employ a DRG or rate-of-increase control PPS enjoy, respectively, $31 and $26 million lower annual general inpatient hospital budgets. Concerning capitated managed care, a one percentage increase in the number of eligibles enrolled in capitated managed care generates estimated savings of $564,823. The average percentage enrollment in capitated managed care for the 1991 to 1996 period was 25 percent, indicating approximate savings of $14 million annually. Note that managed care in Medicaid is relatively new and that related savings may increase as programs mature.

The model further demonstrates important substitute and complementary relationships in general and between service components of Medicaid programs. In accordance with the findings by Miller, et al. (1997), a strong relationship exists between inpatient hospital and physician services. This relationship, however, is twofold; dividing physician services into those offered by (a) office based general practitioners and (b)

hospital based physicians in general, the results indicate, respectively, a substitute or complementary relationship with inpatient hospital services. Significant substitute relationships also exist between inpatient hospital services and nursing facility services and hospital outpatient services. The relationship between inpatient hospital services and intermediate care facility services is significant only after 1991.[42]

The interrelated nature of the various components of Medicaid emphasizes the importance of comprehensive analysis before cost containment measures pertaining to a single component are initiated. Cost containment policies relating to inpatient hospital expenditures, for example, will likely generate a redirection of demand toward substitute services. This migration of demand will, at least partly, offset any reductions in inpatient budgets. Furthermore, if demand is redirected to a less effective mode of care, long term costs may actually increase. Any public policy regarding these services must consider these relationships to be effective.

The results also imply a strong influence by socioeconomic variables. Acquired immunodeficiency syndrome has resulted in significantly higher inpatient hospital expenditures in states with relatively high numbers of reported cases. The slowly but steadily falling number of reported AIDS cases over the past few years may provide a source of relief for these states.

A socioeconomic variable which performed remarkably well is the average household size in the state. A consistent and strong negative relationship is found between the average household size and inpatient hospital expenditures. As discussed earlier, this may be due to two reasons: first, larger households may mean increased time costs concerning hospital visits; and, second, larger households are better capable of

producing substitute care.[43] The results presented here provide support the latter explanation. The first would produce lower utilization only in the short-run. A condition that does not receive attention when necessary may worsen and require increased care at a later date. Since the negative relationship between household size and expenditure levels is stable over time (see regressions A through D), the substitute care hypothesis is favored over the alternative.

SECTION IV.VII: SECONDARY EQUATIONS

The secondary dependent variables are:

1. the number of Medicaid recipients in the state,
2. a dummy variable indicating whether a state has adopted a DRG based PPS,
3. a dummy variable indicating whether a state uses a rate-of-increase PPS,
4. a dummy variable indicating whether a state uses coverage limitations,
5. the percentage of managed care enrollment.

The variation in the size of Medicaid programs across states is explained using a Median voter model. According to this model taxpayers derive utility from the consumption of goods and services as well as from the transfer of income to welfare recipients. The median voter determines the quantity of public goods by maximizing a utility function subject to a budget constraint:

$$\max_{\{X,W\}} U(X,W,Z) \quad s.t. \quad Y = P_x X + P_w W \tag{4.A.1}$$

where X is the quantity of Medicaid services provided and P_x is the tax price to the median voter of an additional unit of service provided. W represents a composite bundle of goods and services, with price P_w, consumed by the median voter, and Z is a set of exogenous factors which influence the median voter's preferences for W or X. The

specific model used in this case is discussed in the first essay "An Analysis Of The Variation In Reimbursement Rates Of Pharmaceutical Drugs Under Medicaid."

The three direct inpatient hospital cost containment and the managed care equations are estimated using a combination of the median voter model and the economic theory of regulation, developed by Gary S. Becker and George J. Stigler. These equations are discussed in detail in the third essay "Prospective Payment Methods And Hospital Expenditures: Special Interests And The Median Voter."

SECTION IV.VIII: BOOTSTRAPPING METHOD

The model to be estimated consists of six equations:

$$y_1 = y_2^{\cdot}\gamma_2 + y_3^{\cdot}\gamma_3 + y_4^{\cdot}\gamma_4 + y_5^{\cdot}\gamma_5 + y_6\gamma_6 + X_1\beta_1 + \varepsilon_1 \qquad (4.B.1a)$$

$$y_2^{\cdot} = X_2\beta_2 + \varepsilon_2 \qquad y_2 = \begin{cases} 1 & \text{if } y_2^{\cdot} > 0 \\ 0 & \text{otherwise} \end{cases} \qquad (4.B.1b)$$

$$y_3^{\cdot} = X_3\beta_3 + \varepsilon_3 \qquad y_3 = \begin{cases} 1 & \text{if } y_3^{\cdot} > 0 \\ 0 & \text{otherwise} \end{cases} \qquad (4.B.1c)$$

$$y_4^{\cdot} = X_4\beta_4 + \varepsilon_4 \qquad y_4 = \begin{cases} 1 & \text{if } y_4^{\cdot} > 0 \\ 0 & \text{otherwise} \end{cases} \qquad (4.B.1d)$$

$$y_5^{\cdot} = X_5\beta_5 + \varepsilon_5 \qquad y_5 = \begin{cases} y_5^{\cdot} & \text{if } y_5^{\cdot} > 0 \\ 0 & \text{if } y_5^{\cdot} \le 0 \end{cases} \qquad (4.B.1e)$$

$$y_6 = X_6\beta_6 + \varepsilon_6 \qquad (4.B.1f)$$

Where, y_1 is hospital inpatient expenditures, y_2, y_3, and y_4 represent the use of direct cost containment policies, y_5 is the percentage of recipients enrolled in managed care, and y_6 represents the number of Medicaid recipients. The "starred" variables represent the latent factors which yield the values of their "non-starred" counterparts. The X_i represent

$(N \times K_t)$ matrices of the exogenous variables of each equation, the β_t are $(K_t \times 1)$ vectors of unknown parameters associated with the exogenous variables, the γ_t are scalar unknown parameters associated with the endogenous variables, and the ε_t are the error terms. Time and individual subscripts are suppressed. The unit of observation is the state. Data was collected for a period of six years (1991 - 1996).

The bootstrap estimation assumes a diagonal variance-covariance matrix:

$$\Sigma = \begin{bmatrix} \sigma_1^2 & 0 & \cdots & 0 \\ 0 & 1 & & \\ & & 1 \ddots & \vdots \\ \vdots & & \ddots 1 & \\ & & & \sigma_5^2 \quad 0 \\ 0 & \cdots & & 0 \quad \sigma_6^2 \end{bmatrix} \tag{4.B.2}$$

To derive the parameter estimates substitute (4.B.1b) - (4.B.1f) into (4.B.1a) to derive the reduced form

$$\begin{aligned} y_1 = &(X_2\beta_2 + \varepsilon_2)\gamma_2 + (X_3\beta_3 + \varepsilon_3)\gamma_3 + (X_4\beta_4 + \varepsilon_4)\gamma_4 + (X_5\beta_5 + \varepsilon_5)\gamma_5 + \\ &(X_6\beta_6 + \varepsilon_6)\gamma_6 + X_1\beta_1 + \varepsilon_1 \end{aligned} \tag{4.B.3}$$

Next, separate the error terms, the parameters, and the X-matrices as

$$y_1 = X_2(\beta_2\gamma_2) + X_3(\beta_3\gamma_3) + X_4(\beta_4\gamma_4) + X_5(\beta_5\gamma_5) + X_6(\beta_6\gamma_6) + X_1\beta_1 + v_1 \tag{4.B.4}$$

where

$$v_1 = (\varepsilon_1 + \gamma_2\varepsilon_2 + \gamma_3\varepsilon_3 + \gamma_4\varepsilon_4 + \gamma_5\varepsilon_5 + \gamma_6\varepsilon_6). \tag{4.B.5}$$

Rewrite (B.4) compactly as

$$y_1 = \mathbf{X}\Pi + \mathbf{v}. \tag{4.B.6}$$

The variance of **v** is defined as

$$\sigma_v^2 = \sigma_1^2 + \gamma_2^2 \cdot 1 + \gamma_3^2 \cdot 1 + \gamma_4^2 \cdot 1 + \gamma_5^2 \cdot \sigma_5^2 + \gamma_6^2 \cdot \sigma_6^2 + 2\gamma_2 \operatorname{cov}(\varepsilon_1, \varepsilon_2) + 2\gamma_3 \operatorname{cov}(\varepsilon_1, \varepsilon_3) + 2\gamma_4 \operatorname{cov}(\varepsilon_1, \varepsilon_4) + 2\gamma_5 \operatorname{cov}(\varepsilon_1, \varepsilon_5) + 2\gamma_6 \operatorname{cov}(\varepsilon_1, \varepsilon_6) \quad (4.B.7)$$

The covariances $\operatorname{cov}(\varepsilon_i, \varepsilon_j) = 0$ for $i, j = 2,3,4,5,6$ and $i \neq j$. For re-sampling obtain

$$\hat{\sigma}_v^2 = \frac{(y - X\hat{\Pi})'(y - X\hat{\Pi})}{(N - K)}. \quad (4.B.8)$$

From (B.7) and (B.8) $\hat{\sigma}_1^2 = \hat{\sigma}_v^2 - (\phi)$, where ϕ is defined by right hand side of (B.7).

The sampling technique used for the bootstrap

Step 1: Estimate equations (B.1a) to (B.1f) by the appropriate technique and obtain $\hat{\sigma}_1^2$ as indicated above, $\sigma_2^2, \sigma_3^2, \sigma_4^2 = 1$ from the Probit model, $\hat{\sigma}_5^2$ from (B.1e) estimated by Tobit, and $\hat{\sigma}_6^2$ from (B.1f) estimated by OLS.

Step 2: From the reduced form equations calculate the predicted values of the dependent variables.

Step 3: Generate random numbers. For each observation, the errors are distributed as

$$\omega_1^* = \begin{bmatrix} v_{1,it}^* \\ \varepsilon_{2,it}^* \\ \varepsilon_{3,it}^* \\ \varepsilon_{4,it}^* \\ \varepsilon_{5,it}^* \\ \varepsilon_{6,it}^* \end{bmatrix} \sim \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \end{bmatrix}, \quad \Omega \quad \Bigg] \quad (4.B.9)$$

where $\Omega = \begin{bmatrix} \sigma_1^2 & \sigma_{12} & \sigma_{13} & \sigma_{14} & \sigma_{15} & \sigma_{16} \\ & 1 & 0 & 0 & 0 & 0 \\ & & 1 & 0 & 0 & 0 \\ & & & 1 & 0 & 0 \\ & & & & \sigma_5^2 & 0 \\ & & & & & \sigma_1^6 \end{bmatrix}$ (4.B.10)

Step 4: Generate $u \sim N(0, I)$ and $\omega_1^* = (\Omega^{1/2} u) \sim N(0, \Omega)$. Use these randomly generated errors and the predicted values of step 2, construct new y^*_t and estimate the parameters using this bootstrap sample. The dichotomous variables are generated as follows:

$$Y_j = \begin{cases} 1 \text{ if } y_t^* \geq 0 \\ 0 \text{ if } y_t^* < 0 \end{cases} \qquad j = 2,3,4 \qquad \text{(4.B.11)}$$

Step 5: Repeat steps 3 - 4 T-times and estimate the variability of the estimates as

$$\hat{\text{var}}(\hat{\pi}_k) = \sum_{t=1}^{T} \frac{(\hat{\pi}_{tk}^* - \hat{\pi}_k^*)}{T-1} \qquad \text{(4.B.12)}$$

and

$$\hat{\text{se}}(\hat{\pi}_k) = \sqrt{\hat{\text{var}}(\hat{\pi}_k)}. \qquad \text{(4.B.13)}$$

SECTION IV.IX: ENDNOTES

[1] Mary Onnis Waid, "BRIEF SUMMARIES OF MEDICARE & MEDICAID Title XVIII and Title XIX of The Social Security Act," Health Care Financing Administration

[2] Services provided by Medicaid agencies fall under the following categories: inpatient hospital, intermediate care facility, skilled nursing facility, pharmaceuticals, physicians, hospital outpatient, home health care, clinic, dental, lab/x-ray, family planning, other practitioners, and other care.

[3] Early examples of institutions which were based on managed care principles, prior to the Health Maintenance Organization Act of 1973, are the Ross-Loos practice clinic of Los Angeles (1929), the Palo Alto Clinic (1929), and Group Health Cooperative of Puget Sound (1947). For a discussion see Robert G. Shouldice and Katherine H. Shouldice, Medical Group Practice and Health Maintenance Organizations, Information Resources Press, Washington D.C., 1978, p. 21-22; and Dustin L. Mackie and Douglas K. Decker, Group and IPA HMOs, Aspen Systems Corporation, 1981, p. 11.

[4] Burton A. Weisbrod, "The Health Care Quadrilemma: An Essay on Technological Change, Insurance, Quality of Care, and Cost Containment," Journal of economic Literature, Vol. XXIX, (June 1991), pp. 523-552.

[5] Stephen Zuckerman, "Medicaid hospital spending: Effects of reimbursement and utilization control policies," Health Care Financing Review, Volume 9, Number 2, Winter 1987, pp.65-77

[6] Paul Gurny, et al. "Chapter 14: Payment, Administration, and Financing of the Medicaid Program," Health Care Financing Review/1992 Annual Supplement (1992): 285-302

[7] Charles Helbing, "Chapter 4: Hospital Insurance Short-Stay Hospital Benefits," Health Care Financing Review/ 1992 Annual Supplement (1992): 55-96.

[8] See, for example, Pauly, M.V., et al., "Managing Physician Incentives in Managed Care," Medical Care, Vol. 28, No.11, (November, 1990): 1013-1023; Newhouse, Joseph, et al., "Are Fee-for Service Costs Increasing Faster Than HMO Costs?" Medical Care, Vol. 23, No. 8, (August 1985): 961; Luft, Harold S., "How do Health-Maintenance Organizations Achieve Their 'Savings'"?, The New England Journal of Medicine, 298, (June 15, 1978): 1336-1343; Manning, Willard G., et al., "A Controlled Trial of the Effect of a Prepaid Group Practice on Use of Services," The New England Journal of Medicine, June 7 (1984).

[9] Hurley, Freund, and Paul, Managed Care in Medicaid. Lessons for Policy and Program Design, Health Administration Press, Ann Arbor Michigan, 1993.

[10] Hurley, Freund, and Paul, Managed Care in Medicaid. Lessons for Policy and Program Design, Health Administration Press, Ann Arbor Michigan, 1993.

[11] Michael Grossman, "On the Concept of health Capital and the Demand for Health," Journal of Political Economy, 80(1972): 223-55

[12] George J. "The theory of economic regulation," Bell Journal of Economics and Management Science, Vol 2. (September 1971): 3-21.

[13] Richard A. Posner, "Taxation by regulation," The Bell Journal of Economics and Management, Vol. 2, No.1 (Spring 1971): 22-50.

[14] Sam Peltzman "Toward a More General Theory of Regulation," Journal of Law and Economics, Vol. XIX(2) (August 1976): 211-244.

[15] Gary S. Becker, "A Theory of Competition Among Pressure Groups For Political Influence," The Quarterly Journal of Economics., Vol. XCVIII, No. 3 (August 1983): 371-400.

[16] For an excellent synopsis of these services see: Paul Gurny, Marilyn Hirsch, and Kathleen Gondek, "Chapter 11: A Description of Medicaid-Covered Services," Health Care Financing Review/ 1992 Annual Supplement, 1992, pp. 227-234.

[17] The model employed to explain the adoption of a PPS is analyzed in dissertation essay number three.

[18] See for example: (1) Evans, R.G. "Supplier-Induced Demand," in M. Perlman ed. The Economics of Health & Medical Care, London, MacMillan 1974, pp.162-173; (2) Rossiter and Wilensky, "A Reexamination of the Use of Physician Services: The Role of Physician Initiated Demand," INQUIRY 20 (1983):231-244; (3) Reinhardt, Uwe E. "The Theory of Physician-Induced Demand: Reflections After a Decade," Journal of Health Economics, 4(1985): 187-193; (4) Rice, "Induced Demand-Can We Ever Know Its Extent," Journal of Health Economics, 1987, 6:375-376

[19] Martin S. Feldstein, "Hospital Cost Inflation: A Study of Nonprofit Price Dynamics," American Economic Review, Volume LXI, Number 5 (December 1971): 861-862

[20] Mark Miller, "The Role of Substitutes in Policy Analysis: Acute Care Services in State Medicaid Programs," Journal of Health Politics, Policy and Law, Volume 13, Number 3, Fall 1988, pp.499-521

[21] Mark E. Miller, W. Pete Welch, and Herbert S. Wong, "Exploring the Relationship Between Inpatient Facility and Physician Services," Medical Care, Volume 35, Number 2, 1997, pp.114-127

[22] For a discussion of the model and variables employed to explain the number of recipient in the state see Pracht and Moore, "An analysis of the variation in reimbursement rates of pharmaceutical drugs under Medicaid," LSU Working paper (1997).

[23] Congressional Research Service: Medicaid Source Book: Background Data and Analysis, Washington, U.S. Government Printing Office, January 1993.

[24] Roger Ricklefs, "AIDS Victems Find That a Death Sentence Leads First to Poverty," The Wall Street Journal, Volume CCX, Number 26, August 5, 1987, pp.1,12

[25] Mary Ann Baily, et al., "Economic consequences for Medicaid of Human immunodeficiency virus infection," Health Care Financing Review/1990 Annual Supplement 1990, pp. 98

[26] Statistical Abstract of the United States, 1995, Table 213.

[27] Baily, Mary Ann, et al., "Economic consequences for Medicaid of Human immunodeficiency virus infection," Health Care Financing Review/1990 Annual Supplement (1990):101.

[28] Arleen Leibowitz, Joan L. Buchanan, and Joyce Mann, "A randomized trial to evaluate the effectiveness of a Medicaid HMO," Journal of Health Economics, 11, 1992, pp. 235-257.

[29] Ian T. Hill, "Improving State Medicaid programs for pregnant women and children," Health Care Financing Review/1990 Annual Supplement, pp.75-87

[30] Sandra J. Tanenbaum, "Medicaid Eligibility Policy in the 1980s: Medical Utilitarianism and the 'Deserving' Poor," Journal of Health Politics, Policy and Law, Volume 20, Number 4, Winter 1995, pp.933-954

[31] Leighton Ku and Teresa A. Coughlin, "Medicaid Disproportionate Share and Other Special Financing Programs," Health Care Financing Review, Spring 1995, Volume 16, Number 3, pp. 27-54.

[32] Warren Salmon, H. Stephen Lieber, Mary C. Ayesse, "Reducing Inpatient Hospital Costs: An Attempt at Medicaid Reform in Illinois," Journal of Health Politics, Policy and Law, Volume 13, Number 1, Spring 1988, pp.103-127

[33] Cynthia G. Tudor, "Medicaid Expenditures and State Responses," Health Care Financing Review, Spring 1995, Volume 16, Number 3, pp. 1-10

[34] Cynthia G. Tudor, "Medicaid Expenditures and State Responses," Health Care Financing Review, Spring 1995, Volume 16, Number 3, pp. 1-10.

[35] This example is based on Leighton Ku and Teresa A. Coughlin, "Medicaid Disproportionate Share and Other Special Financing Programs," Health Care Financing Review, Spring 1995, Volume 16, Number 3, pp. 27-54.

[36] Leighton Ku and Teresa A. Coughlin, "Medicaid Disproportionate Share and Other Special Financing Programs," Health Care Financing Review, Spring 1995, Volume 16, Number 3, pp. 30.

[37] This study was performed in parallel with another which examined the variation in reimbursement of pharmaceutical drugs under Medicaid. For this first study three states were omitted for the following reasons: Arizona's Medicaid program was experimental for most of the study period and Alaska and Wyoming did not cover prescription drugs as a separate service to Medicaid recipients for the first half of the same period.

[38] This model was first suggested by Tobin. See J. Tobin, "Estimation of Relationships for Limited Dependent Variables," Econometrica, 26, 1958, pp. 24-36.

[39] Jeong, Jinook, G.S. Maddala, "'A Perspective on Application of Bootstrap Methods in Econometrics' in G.S. Maddala, C.R. Rao, and H.D. Vinod, eds., Handbook of Statistics," Volume 11(1993): 573-610.

[40] Karl Kronebusch, "Medicaid and the Politics of Groups: Recipients, Providers, and Policy Making," Journal of Health Politics, Policy and Law, Volume 22, number 3, June 1997, pp. 846.

[41] The average general Medicaid inpatient hospital budget for the 1991-1996 period was $252,480,837.

[42] This may be due to the change in payment and user reporting requirements which were part of OBRA 1987. Beginning in 1990, this amendment, combined ICF and SNF services into a single level of care for Medicaid certification purposes. For a better discussion regarding this change see Pine (1992).

[43] Substitute care from family members implies a reduction in the number of recipients. Note, however, that the direct positive effect of an increase in Medicaid recipients is already accounted for in the model.

SECTION IV.X: BIBLIOGRAPHY

Baily, Mary Ann, et al., "Economic consequences for Medicaid of Human immunodeficiency virus infection," Health Care Financing Review/1990 Annual Supplement (1990):97-108

Barer, Morris L., "Case Mix Adjustment in Hospital Cost Analysis. Information Theory Revisited.,"Journal of Health Economics, Number 1 (1982): 53-80

Becker, Gary S., "A Theory of Competition Among Pressure Groups For Political Influence," The Quarterly Journal of Economics., Vol. XCVIII, No. 3 (August 1983): 371-400.

Bellman, Lutz, Jorg Breitung, Joachim Wagner, "Bias Correction and Bootstrapping of Error Component Models for Panel Data: Theory and Applications," Empirical Economics, Volume 14(1989): 329-342

Cone, Kenneth R. and David Dranove, "Why did States Enact Hospital Rate-Setting Laws?," Journal of Law & Economics, Volume XXIX (1986):287-302

Congressional Research Service: Medicaid Source Book: Background Data and Analysis, Washington, U.S. Government Printing Office (January 1993).

Cromwell, Jerry, Killard W. Adamache, Rezaul K. Khandker, and Carol Ammering, "Programmatic, Economic, and Demographic Forces Underlying Medicaid Enrollment Trends," Medical Care Research and Review, Volume 54, Number 2 (June 1997): 150-175

Cromwell, Jerry, Sylvia Hurdle, and Gerard Wedig, "Impacts of Economic and Programmatic Changes on Medicaid Enrollments," Review of Economics and Statistics (1986):232-240.

Custer, William S., James W. Moser, Robert A. Musacchio, and Richard J. Willke, "The Production of Health Care Services and Changing Hospital Reimbursement: The Role of Hospital-Medical Staff Relations.," Journal of Health Economics, Volume 9 (1990): 167-192

Dranove, David, Kenneth Cone, "Do State Rate Setting Regulations Really Lower Hospital Expenses," Journal of Health Economics, Number 4 (1985):159-165

Evans, R.G. "Supplier-Induced Demand," in M. Perlman ed. The Economics of Health & Medical Care, London, MacMillan 1974, pp.162-173

Feldstein, Martin S., "Hospital Cost Inflation: A Study of Nonprofit Price Dynamics," American Economic Review, Volume LXI, Number 5 (December 1971): 853-872

Feldstein, Paul J. and Glenn Melnick, "Congressional Voting Behavior on Hospital Legislation: An Exploratory Study," Journal of Health Politics, Policy and Law, Volume 8, Number 4 (Winter 1984): 686-701

Feldstein, Paul J., "An Economic Perspective on Health Politics and Policy," Quarterly Review of Economics and Business, Vol. 30, No.4 (Winter 1990): 117-135.

Graddy, Elizabeth, "Interest Groups or the Public Interest -- Why Do We Regulate Health Occupations?", Journal of Health Politics, Policy and Law, Vol. 16, No. 1 (Spring 1991): 25-49.

Grannemann, Thomas W., Brown Randall S., Mark V. Pauly, "Estimating Hospital Costs: A Multiple-Output Analysis," Journal of Health Economics, Number 5 (1986): 107-127

Greene, William H., Econometric Analysis, Second Edition, Macmillan Publishing Company, New York, (1990).

Grogan, Colleen, "The Medicaid Managed Care Policy Consensus for Welfare Recipients: A Reflection of Traditional Welfare Concerns," Journal of Health Politics, Policy and Law, Volume 22, Number 3 (1997): 815-838.

Grossman, Michael, "On the Concept of health Capital and the Demand for Health," Journal of Political Economy, 80(1972): 223-55

Harris, Jeffrey E., "The internal organization of hospitals: some economic implications," The Bell Journal of Economics, (1974) :467-482

Hawkins, Sue C. and Donald E. Rigby, "Effects of SSI on Medicaid Caseloads and Expenditures," Social Security Bulletin, Volume 42, Number 2 (1979): 3-14.

Heckman, James J., "Dummy Endogenous Variables in a Simultaneous Equation System," Econometrica, Volume 46, Number 6 (July 1978): 931-959

Helbing, Charles, "Chapter 4: Hospital Insurance Short-Stay Hospital Benefits," Health Care Financing Review/ 1992 Annual Supplement (1992): 55-96.

Hill Ian T., "Improving State Medicaid programs for pregnant women and children," Health Care Financing Review/1990 Annual Supplement (1990):75-87.

Hurley, Robert E. and Deborah A. Freund, "A Typology of Medicaid Managed Care," Medical Care, Volume 26, Number 7 (1988):764-774.

Hurley, Freund, and Paul, Managed Care in Medicaid. Lessons for Policy and Program Design, Health Administration Press, Ann Arbor Michigan, 1993.

Jeong, Jinook, G.S. Maddala, "'A Perspective on Application of Bootstrap Methods in Econometrics' in G.S. Maddala, C.R. Rao, and H.D. Vinod, eds., Handbook of Statistics," Volume 11(1993): 573-610

Kronebusch, Karl "Medicaid and the Politics of Groups: Recipients, Providers, and Policy Making," Journal of Health Politics, Policy and Law, Volume 22, number 3, June 1997, pp. 846.

Ku, Leighton and Teresa A. Coughlin, "Medicaid Disproportionate Share and Other Special Financing Programs," Health Care Financing Review, Volume 16, Number 3 (Spring 1995): 27-54

Lee, Maw Lin, "A Conspicuous Production Theory of Hospital Behavior," The Southern Economic Journal, Volume XXXVIII, Number 1 (July 1971): 49-58

Leibowitz, Arleen, Joan L. Buchanan, and Joyce Mann, "A randomized trial to evaluate the effectiveness of a Medicaid HMO," Journal of Health Economics, 11 (1992): 235-257.

Long, Millard F., "Efficient Use of Hospitals," in The Economics of Health Care, Ann Arbor (1964): 211-226.

Long, Russell B., "Proposals for Medicare-Medicaid Reform and Overall Hospital Revenues Limitation," U.S. Government Printing Office, Washington (1979).

Luft, Harold S., "How do Health-Maintenance Organizations Achieve Their 'Savings'"?, The New England Journal of Medicine, 298, (June 15, 1978): 1336-1343

Mayer, Shirley A., Joseph I. Morris, "Statement on Prospective Reimbursement Systems, before the subcommittee on health, United States Senate Committee on Finance," U.S. Government Printing Office, Washington (1982).

Manning, Willard G., et al., "A Controlled Trial of the Effect of a Prepaid Group Practice on Use of Services," The New England Journal of Medicine, June 7 (1984).

Miller, Mark, "The Role of Substitutes in Policy Analysis: Acute Care Services in State Medicaid Programs," Journal of Health Politics, Policy abd Law, Volume 13, Number 3 (Fall 1988): 499-521.

Miller, Mark E., W. Pete Welch, and Herbert S. Wong, "Exploring the Relationship Between Inpatient Facility and Physician Services," Medical Care, Volume 35, Number 2 (1997): 114-127

Mueller, Keith J., "An Analysis of Congressional Health Policy Voting in the 1970s," Journal of Health Politics, Policy and Law, Vol. 11, No.1 (Spring 1986): 117-135.

Newhouse, Joseph P., "Toward a Theory of Nonprofit Institutions: An Economic Model of a Hospital," American Economic Review, Volume 60 (March 1970): 64-74

Newhouse, Joseph, et al., "Are Fee-for Service Costs Increasing Faster Than HMO Costs?" Medical Care, Vol. 23, No. 8, (August 1985): 961.

Oster, Sharon M., "An Analysis of Some Causes of Interstate Differences in Consumer Regulations," Economic Inquiry, Vol. XVIII (January 1980): 39-54.

Pauly, M.V., et al., "Managing Physician Incentives in Managed Care," Medical Care, Vol. 28, No.11, (November, 1990): 1013-1023

Pauly, Mark V., Michael Redish, "The Not-For-Profit Hospital as a Physicians' Cooperative," American Economic Review, Volume 63, Number 1 (March 1973): 87-99

Peltzman, Sam, "Toward a More General Theory of Regulation," Journal of Law and Economics, Vol. XIX(2) (August 1976): 211-244.

Pine, Penelope, Steven Clauser, and David K. Baugh, "Chapter 12: Trends in Medicaid Payments and Users of Covered Services, 1975-91," Health Care Financing Review/ 1992 Annual Supplement (1992): 235-269.

Posner, Richard A., "Taxation by regulation," The Bell Journal of Economics and Management, Vol. 2, No.1 (Spring 1971): 22-50.

Reder, M.W., "Economic Theory and Nonprofit Enterprise: Some Problems in the Economics of Hospitals," American Economic Review, Volume LV, Number 2 (May 1965): 472-480

Reinhardt, Uwe E. "The Theory of Physician-Induced Demand: Reflections After a Decade," Journal of Health Economics, 4(1985): 187-193

Rice, "Induced Demand-Can We Ever Know Its Extent," Journal of Health Economics, 1987, 6:375-376

Ricklefs, Roger, "AIDS Victems Find That a Death Sentence Leads First to Poverty," The Wall Street Journal, Volume CCX, Number 26 (August 5, 1987):1,12

Rossiter and Wilensky, "A Reexamination of the Use of Physician Services: The Role of Physician Initiated Demand," INQUIRY 20 (1983):231-244.

Salmon, J. Warren, H. Stephen Lieber, Mary C. Ayesse, "Reducing Inpatient Hospital Costs: An Attempt at Medicaid Reform in Illinois," Journal of Health Politics, Policy and Law, Volume 13, Number 1, (Spring 1988): 103-127.

Stevens, Carl M., "Hospital Market Efficiency: The Anatomy of the Supply Response" in H. Klarman, Empirical Studies in Health Economics, The Johns Hopkins Press, Baltimore, 1970

Stigler, George J. "The theory of economic regulation," Bell Journal of Economics and Management Science, Vol 2. (September 1971): 3-21.

Tanenbaum, Sandra J., "Medicaid Eligibility Policy in the 1980s: Medical Utilitarianism and the 'Deserving' Poor," Journal of Health Politics, Policy and Law, Volume 20, Number 4 (Winter 1995): 933-954.

Tobin, J. "Estimation of Relationships for Limited Dependent Variables," Econometrica, Volume 26 (1958): pp. 24-36.

Tudor, Cynthia G., "Medicaid Expenditures and State Responses," Health Care Financing Review, Volume 16, Number 3 (Spring 1995): 1-10

Wade, Martcia and Stacy Berg, "Causes of Medicaid Expenditure Growth," Health Care Financing Review, Volume 16, Number 3 (Spring 1995): 11-25.

Waid, Mary Onnis "BRIEF SUMMARIES OF MEDICARE & MEDICAID Title XVIII and Title XIX of The Social Security Act," Health Care Financing Administration

Weisbrod, Burton A., "The Health Care Quadrilemma: An Essay on Technological Change, Insurance, Quality of Care, and Cost Containment," Journal of economic Literature, Vol. XXIX, (June 1991): 523-552

Wendling, Wayne and Jack Werner, "Nonprofit Firms and the Economic Theory of Regulation," Quarterly Journal of Economics and Business, Vol. 20, No. 3 (Autumn 1980): 6-18.

Zuckerman, Stephen, "Medicaid hospital spending: Effects of reimbursement and utilization control policies," Health Care Financing Review, Volume 9, Number 2 (Winter 1987): 65-77.

CHAPTER V

SUMMARY AND CONCULSIONS

A common theme of the three essays of this dissertation is cost containment in Medicaid. The first essay examined reimbursement rates of the two main components of the prescription drug price in the context of pharmaceutical drug expenditure levels. The second and third essays focussed on cost containment measures pertaining to inpatient hospital expenditures.

The primary purpose of the first essay was to analyze the extent to which interest groups, among other factors, influence reimbursement rates of the two components of pharmaceutical drugs under Medicaid at the state level. Understanding the factors which determine reimbursement rates, and, in particular, the magnitude of these relationships, is important for the following reasons. To the extent that differences in the political influence of interest groups result in differences in reimbursement rates we may expect there to be discrepancies in the treatment of the poor across states. This has important implications regarding the goal of Medicaid which is to provide medical services to the nation's poor (1) in an equitable fashion and (2) in quantities and qualities comparable to those observed in the private health industry. These goals may be compromised to the extent that special interest groups influence reimbursement levels at the state level.

Furthermore, there are policy implications regarding recent arguments made in the U.S. Congress, concerning increased control over Medicaid at the state level. Proponents of state control point to advantages of the "efficiency" of localized adaptation. However, strong influence by interest groups at the state level would likely result in growing differences in program design and, consequently, greater disparities in

the treatment of the poor across states, contradicting the goals of the program. Within the context of pharmaceutical drug reimbursement rates, access problems may arise in states which severally cut reimbursement rates.

The endogenous variables involve the dispensing fee and the percentage markup components of the pharmaceutical drug price. The percentage markup constitutes the difference between reimbursement rates and the actual acquisition cost of drug ingredients to pharmacists. The analysis employs the economic theory of legislation and median voter models to explain the variation in reimbursement rates. The dispensing fee and percentage markup equations are then considered in a larger system including the number of Medicaid recipients and the prescription drug expenditures of the state. The system was estimated using the three stage least squares estimator to take advantage of the contemporaneous correlation between the equations.

The results indicate that interest groups have significant influence on reimbursement levels of pharmaceutical drugs. Particularly, the pharmacist and physician groups are shown to have been successful in protecting their members' interests. Furthermore, reimbursement levels significantly effect Medicaid pharmaceutical drug expenditure levels. Therefore, interest groups also indirectly influence expenditure levels. An important policy implication is that discrepancies in the treatment of the poor would likely increase with a transfer of control over Medicaid from the federal to the state level.

The second essay analyzes the factors determining the adoption of Medicaid inpatient hospital cost containment policies. The purpose and importance of this essay are similar to those of the first. To the extent that different factors at the state level

determine the probabilities of agencies adopting cost containment policies we may expect the treatment of the poor to be differential across states. As before the findings of this essay may have some implications for the goals of Medicaid and policies recently discussed in congress regarding the increased transfer of control over the program to the state level. Within the context of Medicaid inpatient hospital, strong utilization controls may make Medicaid patients a liability to hospitals. As a consequence, these hospitals would either eliminate or severely limit services offered to Medicaid eligibles. Stated differently, the quantity and quality of services rendered to Medicaid recipients would suffer.

The cost containment policies analyzed in this essay are (1) the adoption of a prospective payment system (PPS) based on diagnosis related groups (DRG), (2) the adoption of a PPS based on rate-of-increase controls, (3) the adoption of direct utilization controls, (4) the enrollment of Medicaid eligibles in managed care, and (5) the enrollment of Medicaid eligibles in capitated managed care. Similar to the first essay, the economic theory of legislation and the median voter model play an integral role in explaining the probabilities of states adopting inpatient hospital cost containment measures.

Both interest group and median voter variables are found to have significant influence on the probability of states adopting inpatient hospital cost containment measures. This implies that the quality and cost of Medicaid hospital care across the states will vary depending on the relative strength of interest groups as well as taxpayers' generosity. Discrepancies in the treatment of the poor would likely increase with a transfer of control to the state level.

The purpose of the third essay is a comparison of the relative effectiveness of alternative Medicaid inpatient hospital cost-containment policies. Medicaid agencies may attempt to control costs by (1) directly controlling prices and utilization of inpatient hospital services, (2) by employing market oriented managed care principles, or (3) by indirect controlling the size of the eligible population. The focus is on the first two alternatives.

States started experimenting with inpatient hospital cost-containment almost immediately following the enactment of Medicaid. During the 1980s they started adopting prospective payment mechanisms and direct utilization controls, and during the 1990s the use of managed care started increasing rapidly. Which method achieves the largest savings? The endogenous variables of interest in this essay are Medicaid inpatient hospital expenditures, the endogenous variables discussed in the second essay, and the size of the Medicaid population.

The economic theory of legislation and the median voter model are used to explain the adoption of cost-containment policies. In addition to inpatient cost containment policies the model accounts for supply, demand, federal policy, substitute or complement services, and non-hospital cost-containment variables. A two stage estimation method is employed and standard errors are estimated using a bootstrap method. The results indicate that both direct control over prices or utilization and managed care are effective in reducing expenditure levels compared to the traditional fee-for-service methods. PPS generated larger saving than managed care, perhaps because the former is relatively well established, while the latter is still relatively new in Medicaid.

VITA

Etienne E. Pracht was born and raised in Paramaribo, Suriname, South America. At the age of nineteen he immigrated to the United States to attend college at the University of South Florida at New College where he earned the degree of Bachelor of Arts in economics. Following several years in private sector industry, Etienne entered the graduate program in economics at Louisiana State University where he earned the degree of Doctor of Philosophy in 1998.

DOCTORAL EXAMINATION AND DISSERTATION REPORT

Candidate: Etienne E. Pracht

Major Field: Economics

Title of Dissertation: An Analysis of Reimbursement Methodologies and Cost Containment Policies in Medicaid Inpatient Hospital and Pharmaceuticals

Approved:

William J. Moore
Major Professor and Chairman

Dean of the Graduate School

EXAMINING COMMITTEE:

Boris L. Carver

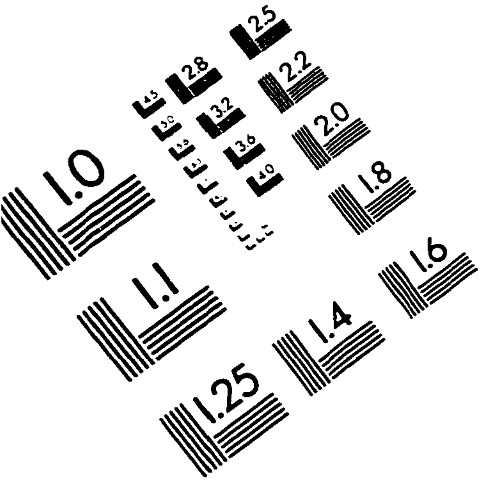
R. Carter Hill

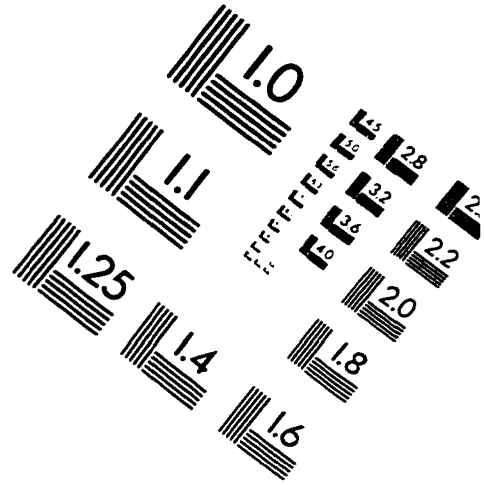
Nicholas M. Kiefer

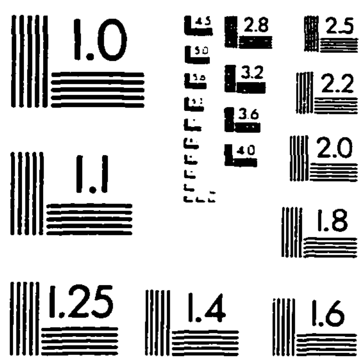
Date of Examination:

March 3, 1998

IMAGE EVALUATION TEST TARGET (QA-3)







150mm

6"