Abstract  A simultaneous equations model is estimated to analyze the interaction between state Medicaid pharmaceutical drug reimbursement rates, drug recipients per capita, and expenditures per drug recipient. Interest groups are shown to have a strong positive impact on pharmacy reimbursement rates, which, in turn, have an impact on pharmacy participation rates and drug utilization and expenditure patterns. Finally, a strong inverse relationship exists between expenditures per recipient and program size. The results verify the existence of substantial variation in state Medicaid programs and point to potentially growing disparities as a result of current policies.

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

By 1995, Medicaid expenditures had climbed to $120.1 billion, which represented 12.1 percent of national health care spending (U.S. Department of Commerce 1997). The Medicaid program experienced extraordinary growth rates during the late 1980s and early 1990s. Since 1985, drug service expenditures have risen faster than all other service expenditures, causing their share of the Medicaid budget to rise from 6.24 percent in 1985 to 8.74 percent in 1996. To slow the growth of Medicaid drug spending, states enacted several types of drug cost containment policies, including closed formularies, drug utilization review programs, maximum allowable cost programs, and co-payments.

States also changed their drug reimbursement rates. Two changes are of particular interest to the current study. First, federal pressure caused
the majority of states to reduce the reimbursement of the ingredient cost component of a prescription drug’s price. Historically, these reimbursement rates had been based on the average wholesale price (AWP) of drugs, which overstates the actual acquisition cost (AAC) of drugs (Kreling 1991). Second, most states allowed the real dispensing fee component of reimbursements to decline, until Congress became concerned about pharmacies’ participation and patient access to drug services. Addressing this concern, the Omnibus Budget Reconciliation Act of 1990 included provisions for a four-year moratorium on reductions in nominal dispensing fees (Lamphere-Thorpe et al. 1994).

The main focus of this article is the underlying process determining drug reimbursement rates at the state level and the effects these rates have on expenditures and access to pharmacy services. A simultaneous equations system is estimated to analyze the factors determining reimbursement levels of dispensing fees and ingredient cost and the sum of these drug price components. We are particularly interested in the roles played by special interest groups and industry characteristics. A good understanding of these factors is crucial for the construction of effective and efficient cost control legislation. The system of equations is then used to examine the relationship between reimbursement levels, drug expenditures per drug recipient, and the number of drug recipients. The model allows us to formally test the following hypotheses: (1) interest groups and industry characteristics play key roles in determining reimbursement levels; (2) higher pharmacy reimbursements translate into better access to services, indicated by systematically higher utilization; (3) higher reimbursement rates also increase expenditures per drug recipient; and (4) states respond to increases (federally imposed or otherwise) in expenditures per recipient with reductions in the number of individuals covered.

The following section of this article provides a general outline of the Medicaid program and the pharmaceutical drug component. The next two sections discuss the theoretical framework and econometric specification and are followed by a description of the data. The article’s last two sections discuss the results, conclusions, and policy implications.

The Medicaid Program and Prescription Drug Coverage

Medicaid Prescription Drug Benefits

Medicaid is a joint state and federal program enacted in 1967 under Title XIX of the 1965 amendments to the Social Security Act. The goal of this
public health insurance program is to provide medical care for the indigent and medically needy in the quantities and qualities generally prevailing in the private sector of the industry. While prescription drug benefits are optional, all states currently provide them to their Medicaid enrollees. During the past two decades the prescription drug component of Medicaid became increasingly important in terms of the percentage of the total Medicaid budget claimed, rising from 6.24 percent in 1985 to 8.74 percent in 1996. This increase may be explained by extraordinary growth in both the number of drug recipients and drug expenditures per drug recipient. Table 1 contains a comparison of growth rates (a) in the number of drug recipients (column 3) and the number of overall recipients (column 4), (b) drug expenditures per drug recipient (column 5) and overall expenditures per recipient (column 6), and (c) drug expenditures (column 7) and overall expenditures (column 8). With the exception of a few years, the number of drug recipients and drug expenditures per drug recipient grew faster than their overall program counterparts, resulting in a rising share of drug expenditures relative to the overall budget (column 1).

The data in Table 1 exhibit substantial variation over time in growth rates of drug recipients, overall recipients, per drug recipient drug expenditures, per recipient expenditures, drug expenditures, and overall expenditures. The largest increases during the 1985–1996 period are concentrated between 1990 and 1992. Several factors contributed to this increased growth. First and most important, federally mandated eligibility expansions during this period, affecting low-income infants, children, and pregnant women, account for a large part of this increased growth (Coughlin et al. 1994; Wade and Berg 1995). Second, revenue-enhancing provider-specific tax and voluntary donation (T&D) programs, adopted by states during the late 1980s to enhance their programs, also contributed to this growth (Ku and Coughlin 1995). The Medicaid Voluntary Contribution and Provider-Specific Tax Amendments of 1991 reduced states’ ability to use these programs in subsequent years. Third, the Medicare Catastrophic Coverage Act of 1988 required states to assume the Medicare liabilities of low-income qualified Medicare beneficiaries (QMBs). Fourth, the 1990 Supreme Court Zebley decision retroactively expanded the SSI eligibility criteria and consequently Medicaid coverage for disabled children (Wade and Berg 1995). Finally, the national recession between 1990 and 1992 undoubtedly increased the eligible Medicaid population through increased unemployment rates (Grannemann 1979; Holahan and Cohen 1986; Cromwell, Hurdle, and Wedig 1986; Cromwell et al. 1997; Holahan and Liska 1997).
<table>
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<th>Year</th>
<th>Drug % of Total Expenditures</th>
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<th>%Δ Per Drug Recipient</th>
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The percentage change in per drug recipient drug expenditures (Table 1, column 5) also shows a higher-than-average increase between 1994 and 1996, after a relative drop in 1993 and 1994. This increase is likely due, at least in part, to increased average drug prices. The average Medicaid drug price, as reported by the National Pharmaceutical Council, increased from $18.40 in 1993 to $24.50 in 1996.

**Prescription Drug Reimbursement under Medicaid**

The price of prescription drugs can be broken down into an ingredient cost component, also referred to as the pharmacist’s acquisition cost, and a dispensing fee component. The dispensing fee, in turn, is divided into a dispensing cost and a net profit; acquisition and dispensing costs ordinarily constitute the break-even cost for a pharmacist. Ingredient costs and dispensing fees are reimbursed by state Medicaid programs through separate but, as we will show, not independent procedures.

Because of difficulties in measuring the actual acquisition costs (AAC), states initially based the ingredient cost component on either the wholesale acquisition cost (WAC) or the average wholesale price (AWP) of drugs. Both of these instruments generally overestimated the AAC of a drug, thus providing a second source of profit for participating pharmacies, which we label the percentage markup. The sum of the net profit embedded in the dispensing fee relative to the average drug price and the percentage markup provides an estimate of total profits in percentage terms received by pharmacies participating in the Medicaid drug program.1

Under the Medicaid program, states have substantial discretionary power in setting provider reimbursement rates subject to federal and judicial guidelines. In the 1980s many states lowered their pharmacy reimbursement rates in an attempt to control costs. Nationally, the average real dispensing fee (expressed in 2000 dollars) declined from $4.50 in 1985 to $3.89 in 1996, despite a moratorium on reducing nominal dispensing fees from January 1991 to December 1994 under the Omnibus Budget Reconciliation Act of 1990.

The national average percentage markup declined even more rapidly than the dispensing fee over this period, falling from 14.73 percent in 1985 to 5.75 percent in 1996. The decline in the percentage markup was due to

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1. A more-detailed description of the dispensing fee, the percentage markup, and total pharmacy profits is provided in an appendix, which will be made available on request.
pressure from the Health Care Financing Administration (HCFA) (now the Centers for Medicare & Medicaid Services [CMS]). Traditionally, the reimbursement of ingredient cost had been based on the AWP, which generated an average percentage markup of 16 percent (see Appendix A), with little variation across states. Recognizing this fact, the HCFA began pressuring states to improve their estimates of the AAC of drugs and to lower their reimbursement rates accordingly. In 1985 only eight states adjusted the AWP (or WAC) for purposes of reimbursement. By 1996, forty-six states had made such adjustments.

The substantial discretionary power granted to the states in setting their pharmacy reimbursement rates caused dispensing fees and percentage markups to vary widely across the states. For example, in 1994 the dispensing fee ranged from a low of $2.75 in West Virginia to a high of $6.18 in Maryland and $7.45 in Alaska.2 In that same year five states (Idaho, New York, Pennsylvania, Rhode Island, and West Virginia) had percentage markups of 16 percent, while Florida’s markup was only 3.6 percent.

The variations in state dispensing fees and percentage markups cannot be attributed to differences in the costs of dispensing drugs or to actual acquisition costs. Kathleen Adams, David Kreling, and Kathleen Gondek (1994) reported that the state Medicaid mean-estimated ingredient cost per drug in 1990 was $18.16, with a standard deviation of $1.17. In contrast, our mean calculated percentage markup for that year was 7.35 percent, with a standard deviation of 3.44 percent. Similarly, they reported that estimated state dispensing costs had significantly less dispersion than did state dispensing fees. The factors underlying the increased variation in reimbursement levels include the activities of interest groups, economic conditions, demand forces, and industry characteristics. These are discussed in more detail in the following sections.

The Model

Following the recent literature on the provision of public goods, we assume that states have a desired level of Medicaid expenditures based on the median voter’s income and the tax price of providing services (Graneman 1980; Holahan and Cohen 1986; Cromwell, Hurdle, and Wedig 1986; Wade and Berg 1995; Cromwell et al. 1997). Within the Medicaid budget, policy makers have some desired level of drug expenditures or drug share.

2. Most states have fixed dispensing fees, but sixteen states use variable dispensing fees. For purposes of analysis, we use the average of the variable dispensing fees.
For this given level of drug expenditures, policy makers attempt to maximize a utility function $U(R, S)$. The two arguments in the utility function represent the drug recipient population size ($R$) and the quality level of services provided to those recipients ($S$). Both $(dU/dR)$ and $(dU/dS)$ are assumed to be positive. Levels of $R$ and $S$ are determined simultaneously and together determine the amount of resources states devote to Medicaid prescription drug services. Relative to the size of a state’s population, Medicaid prescription drug expenditures at the state level may be expressed by the identity

$$\frac{\text{Drug Expenditures}}{\text{State Population}} = \frac{\text{Drug Recipients}}{\text{State Population}} \times \frac{\text{Drug Expenditures}}{\text{Drug Recipients}} \quad (i)$$

The identity indicates that programs face a trade-off in the “breadth” (i.e., number of recipients) and the “depth” (i.e., expenditures per recipient) of Medicaid drug spending (Granneman 1980; Holahan and Cohen 1986; Cromwell et al. 1997). With a fixed level of drug expenditures per capita, the state can choose to enroll large numbers of the poor and spend less per recipient or to enroll fewer poor and spend a greater amount per recipient.

Figure 1 portrays the Medicaid decision process in more detail. The arrows flowing in either direction between the Medicaid recipient to population ratio block and the per recipient drug expenditures block indicate they are determined simultaneously. The number of drug recipients per capita and the amount of drug expenditures per recipient are influenced by both federal and state policies. From 1984 to 1992 the federal government adopted a number of policies that permitted or mandated that states expand their Medicaid populations, particularly among children, pregnant women, the elderly, and disabled groups (Wade and Berg 1995; Cromwell et al. 1997; Coughlin, Ku, and Holahan 1994; Holahan and Liska 1997). Within established federal guidelines, states can control the number of drug recipients by setting eligibility standards for the Aid to Families with Dependent Children (AFDC) and the Supplemental Security Income (SSI) welfare programs, which provide access to the Medicaid program. States also have the option of providing Medicaid coverage to low-income pregnant women and children, the aged, the blind, and the disabled, and under section 1115 waivers some states have even more flexibility concerning coverage to other population groups and to higher-income individuals. Finally, states are able to decide the extent to which they will cover the medically needy.
Within federal guidelines, states also can exercise some control over the amount of drug expenditures per drug recipient. Through the use of drug formularies, prior authorization, and drug utilization review (DUR) programs, states can control the types and utilization rates of drugs that are reimbursed. They can adopt drug co-payments and impose quantity restrictions on Medicaid drugs. Finally, states can determine reimbursement rates for pharmacists, which may influence their participation rates and pharmacy access to Medicaid recipients. Federal and state policies are not determined in a vacuum. They are influenced by provider interest groups, taxpayer preferences, and demand factors.

This article focuses on the determinants and effects of pharmacy reimbursement rates. As shown in Figure 1, there exists a hypothesized bidirectional relationship between reimbursement rates and per recipient expenditures and the recipients to population ratio. Reimbursement rates are not determined independently of expenditure levels; states that experience high per recipient expenditures may lower reimbursement levels as a cost containment measure. On the other hand, as explained in the next section, a high recipient to population ratio is hypothesized to increase reimbursement rates.

### Econometric Specification

Any factor that influences the number of recipients or expenditures per recipient must, according to equation (i), also affect total expenditures. The system of equations we estimate is as follows:

\[
\begin{align*}
y_1 &= \gamma_11y_2 + \gamma_12y_3 + X'\beta_1 + \epsilon_1 \\
y_2 &= \gamma_21y_1 + \gamma_22y_3 + Z'\beta_2 + \epsilon_2 \\
y_3 &= \gamma_31y_1 + \gamma_32y_2 + V'\beta_3 + \epsilon_3
\end{align*}
\]
where \( y_1 \) is estimated total pharmacy profits, \( y_2 \) is the drug recipient to population ratio, and \( y_3 \) is drug expenditures per drug recipient. The matrices \( X, Z, \) and \( V \) contain the exogenous variables in each of the equations, the \( e_i \) are the error terms, and all other Greek characters represent the unknown parameters. If total pharmacy profits are decomposed into dispensing fee and percentage markup, the system can be expanded as follows

\[
\begin{align*}
\hat{y}^a_i &= \gamma_{11}y_2 + \gamma_{21}y_3 + X^a\beta_i^a + \epsilon_i^a \\
\hat{y}^b_i &= \gamma_{11}y_2 + \gamma_{21}y_3 + X^b\beta_i^b + \epsilon_i^b \\
y_2 &= \gamma_{12}\hat{y}_i^a + \gamma_{22}\hat{y}_i^b + \gamma_{32}y_3 + Z^t\beta_2 + \epsilon_2 \\
y_3 &= \gamma_{13}\hat{y}_i^a + \gamma_{23}\hat{y}_i^b + \gamma_{33}y_2 + V^t\beta_3 + \epsilon_3
\end{align*}
\]

where \( y_i^a \) and \( y_i^b \) are the dispensing fee and percentage markup, respectively.

The remainder of this section considers the right-hand side of the equations. The discussion of each equation is preceded by the full equation, with the endogenously determined variables listed first, followed by the exogenous factors.

**Pharmacy Total Profit Equation**

The estimated pharmacy total profit equation is

\[
y_1 = \gamma_{11} \cdot (\text{per recipient drug expenditures}) \times (\text{taxprice}) + \gamma_{21} \cdot \text{drug recipients/state population} + \\
\beta_{11} \cdot \%\text{APhA membership} + \beta_{21} \cdot \%\text{AMA membership} + \\
\beta_{31} \cdot \%\text{drug manufacturing} + \beta_{41} \cdot \text{PhRMA dummy} + \\
\sum \beta_{i1} \cdot \text{controls} + \sum \text{year dummy}_i + \epsilon_1
\]

The explanatory variables in this equation may be categorized as endogenous public policies, special interests, industry characteristics, and other control variables.

**Endogenous Public Policies.** A state’s incentive to implement cost containment policies, or to limit reimbursement rates, is hypothesized to be a product of the political cost of taxation. States that experience high drug expenditures per drug recipient or that have higher numbers of drug recipients per capita (both of which are determined endogenously in our system) face greater budgetary pressures, all else being equal, and therefore they may be more inclined to limit reimbursement levels. Drug expenditures per drug recipient are interacted with the price to state taxpayers to capture their combined effect on reimbursement rates. The tax price is
calculated as the percentage of expenditures paid for by the state, or 100 minus the federal Medicaid assistance percentage (FMAP). The impact of this interaction variable on reimbursement rates is expected to be negative.

Provider Interest Groups. According to the economic theory of regulation, industries or special interest groups acquire or solicit from the state regulation that is designed and operated for their benefit (Stigler 1971; Becker 1983; Feldstein 1984 and 1990; Graddy 1991; Mueller 1986). 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 with both each other and the legislature. Groups that are more easily organized and whose members are affected more directly and expect to acquire greater gains or losses, 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 piece of legislation is expressed in terms of political support or loss, through votes, campaign contributions, or volunteer time from groups affected by that legislation. Cone and Dranove (1986) and Moore and Newman (1993) have argued that interest groups have played a role in states’ adoption of Medicaid cost containment policies.

The interaction between groups that are relevant to the pharmaceutical industry is described by Pollard and Coster (1991). In their research involving the hearings on skyrocketing prescription drug prices by the U.S. Senate Special Committee on Aging, the authors describe the proceedings as a “sometimes bitter struggle between pharmaceutical manufacturers” and selected groups, including retail pharmacists, as the groups endeavored to protect their interests. At the center of the hearings on prescription drug prices and rising Medicaid budgets, held by Senator David Pryor, was cost containment. Efforts to contain costs had, up to 1989, included limits on beneficiaries’ access to prescription drugs, cost-sharing approaches, and reductions in pharmacy reimbursements. The notable exception to these efforts was the price of prescription drugs purchased by state Medicaid programs. Given the failure of the previous efforts to curtail the growth of prescription drug expenditures, members of Congress turned their attention to prescription drug prices.

The interest groups most concerned with Medicaid pharmacy reimbursement levels are recipients, pharmacies, physicians, and drug manufacturers. 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 (Adams and Gavin 1996). Furthermore, higher reimbursement rates may translate into more time and attention devoted to each recipient (Sloan, Mitchell, and Cromwell 1978). As Kronebusch (1997) stresses, however, with the exception of the elderly, most Medicaid recipient groups have low income, and they are poorly organized. Thus, they are not expected to be politically powerful. Nonetheless, the interest group aspect makes the effect of the drug recipient per capita variable in the pharmacy profit equation uncertain.

Pharmacies are expected to lobby for higher Medicaid prescription drug reimbursement rates. Because of an absence of data on political contributions, we use the percentage of pharmacists in each state belonging to the American Pharmaceutical Association (APhA) to capture the influence of this interest group. Following Mueller (1986) we use the membership variable as an indicator of the group’s lobbying strength. The APhA membership rate in 1989, the middle year of this study, ranged from a low of 11.88 percent in Mississippi to a high of 52.45 percent in Maryland, with an average of 32 percent.

What about physician interest groups? Unlike drug cost containment policies, which are aimed, for example, at reducing the range of available drugs, such as formularies, drug reimbursement does not affect this group directly. Nonetheless, they are expected to have a preference regarding different cost containment measures; particularly, physicians favor policies that do not affect their freedom to prescribe the most appropriate drug to an individual patient. Physicians are therefore expected to support lower 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 percentage of physicians in each state belonging to the American Medical Association is utilized to capture its influence. The average membership rate of the AMA in 1989 was 55 percent, ranging from 33 percent (Vermont) to 86 percent (North Dakota).

The last provider group hypothesized to have an interest in drug reimbursement rates is the drug manufacturing industry. Containment of the Medicaid budget has been at the forefront of the political debate for more than a decade. Similar to physicians, this group is expected to support a lower level of reimbursement for both the dispensing and the ingredient cost. The more that states save by reducing dispensing fees and the markup, the smaller will be the effort to enact legislation that will adversely affect the drug manufacturing industry. We use two variables to measure this industry’s lobbying capacity. The industry’s employment relative to the state’s manufacturing base is used to measure its influence and is hypoth-
esized to have a negative effect on Medicaid pharmacy reimbursement rates. This is consistent with Kronebusch’s (1997) argument that the size of the interest group is important because politicians pay attention to the potential number of voters the group represents. The second variable we include in the model is a dummy variable that indicates the presence of members of the Pharmaceutical Research and Manufacturers of America (PhRMA), the primary lobbying group for the pharmaceutical industry.

Table 2 contains comparisons between states, based on interest group representation during the middle and final years of the study period. In 1989, states with above-average APhA membership rates had lower dispensing fees but higher percentage markups and, according to expectations, a higher average pharmacy percentage profit. In 1996, states with above-average APhA membership rates had higher dispensing fees; however, the gap between the percentage markup and the average percentage profit had disappeared. Comparisons of simple averages between states with above- and below-average AMA or PhRMA membership rates show only slight differences in 1989. By 1996, as was the case with the APhA membership comparison, the differences disappeared.

Industry Structure. In general, independent pharmacies are smaller than chain pharmacies, and independents have higher costs of dispensing and higher drug acquisition costs than do chains (Lamphere-Thorpe et al. 1994; Adams, Kreling, and Gondek 1994). Furthermore, independents have higher prescription to sales ratios than do chains, and the Medicaid share of prescriptions is higher in independents than in chains (Lamphere-Thorpe et al. 1994; Schondelmeyer and Thomas 1990). All of these factors suggest that independent pharmacies have stronger incentives than do chains to lobby for higher Medicaid pharmacy reimbursements, even though their lobbying strength is smaller compared to that of the larger chains. However, it is possible that independents have a more favorable group image with the legislature than do chains, which as Kronebusch (1997) explains, would increase independents’ lobbying effectiveness. To capture the significance of the industry structure, the percentage of chain pharmacists in the state is included in the regression. A negative sign is expected for this variable.

A word of caution is in order here. It is possible that the causation between the percentage of chain pharmacists and Medicaid pharmacy reimbursements runs in the opposite direction. Declines in Medicaid pharmacy reimbursement rates in the 1980s may have had a greater impact on independents than on chains, for reasons just stated. As a consequence,
more independents may have gone out of business, leading to a higher percentage of chain pharmacies. The percentage of pharmacists identified by the National Pharmaceutical Council as “community pharmacists” declined from 59 to 37 percent during the study period. Of course, many other factors have led to the relatively rapid growth of chain pharmacies over the past several decades (Schondelmeyer and Thomas III 1990).

Other Control Variables. Two political climate variables are included in the pharmacy profits equation. To capture the effect of the dominant political ideology, the percentage of congressional Democratic representatives in the state is included in the model. Democratic representatives gener-
ally have more liberal views and are assumed to favor higher outlays for public welfare programs like Medicaid. A second political variable that has been hypothesized to affect public programs is the amount of competition among parties (Plotnick 1986; Plotnick and Winters 1985; Ranney 1976). An index, ranging between zero and one, is calculated based on the party composition of the governorship, the lower house, and the upper house. An index of zero means total political dominance by a single party, while an index of one implies an even division of power.

We also included a dummy variable having a value of one in states employing fixed dispensing fees, and zero in states employing variable dispensing fees. Finally, we included year dummy variables to account for changes in federal policies that may have affected pharmacy total profit or its components. No signs are posited for these control variables.

### Medicaid Drug Recipients

The second endogenous variable in the system is the ratio of Medicaid drug recipients to the state population.

\[ y_2 = \gamma_{12} \cdot \text{estimated total pharmacy profit} + \gamma_{22} \cdot \text{per recipient drug expenditures} + \beta_{12} \cdot \text{per capita physicians} + \beta_{22} \cdot \text{per capita pharmacists} + \sum_i \beta_{i2} \cdot \text{control variable}_i + \sum_t \text{year dummies}_t + \epsilon_2 \]

In addition to the endogenously determined variables, the right-hand side of the second equation consists of the provider/interest group variables, which are the primary focus of this study, and a set of control variables.

#### Endogenous Public Policies

We hypothesize that higher pharmacy profits are likely to increase pharmacy participation rates in the Medicaid program. The higher participation rates, in turn, will lower access costs and increase drug utilization rates as measured by drug recipients per capita. We noted earlier that states have an implicit spending limit and that they are likely to respond to increases in drug expenditures per drug recipient by reducing the number of drug recipients.

#### Provider/Interest Group Variable

Increased competition among providers reduces the demand for services from individual providers and may increase their willingness to participate in the Medicaid program (Sloan, Mitchell, and Cromwell 1978). Also, greater numbers of providers reduce the time costs to taxpayers of supporting the Medicaid insurance program. To account for these factors, we include state per capita physicians and
state per capita pharmacists in our drug recipient equation. Because physician services and drugs are generally complementary services, we expect both of these variables to have a positive influence on per capita drug recipients. Furthermore, if increased numbers lead to greater participation in the Medicaid program, these provider variables also represent group interests. Finally, if state decision makers positively respond to the size of potential interest group votes, as suggested by Kronebusch (1997), this provides another reason to expect these variables to have a positive effect on the per capita number of Medicaid recipients.

Control Variables. Based on the existing literature, we include the following control variables in our Medicaid drug recipients’ equation: tax price, percent of welfare expenditures in the states’ budget as a proxy for the median voter’s tastes and preferences, state poverty rate, state unemployment rate, real AFDC cash benefits, a medically needy drug program dummy variable, and year dummy variables to capture federal policy changes (Granneman 1980; Holahan and Cohen 1986; Cromwell, Hurdle, and Wedig 1986; Wade and Berg 1995; Cromwell et al. 1997). The reasons for including these variables and their anticipated signs are well established in the literature and need not be repeated here.

Drug Expenditures per Drug Recipient

The third endogenous variable in the system is the prescription drug expenditures per drug recipient. This variable measures the quality and quantity of prescription drug resources allocated to the typical drug recipient. The equation estimated is

\[
y_3 = \gamma_{13} \cdot \text{estimated total pharmacy profit} + \gamma_{23} \cdot \text{drug recipients/state population} + \beta_{13} \cdot \% \text{ recipients age 21} + \beta_{23} \cdot \% \text{ recipients age 65} + \beta_{33} \cdot \% \text{ recipients disabled} + \beta_{33} \cdot \text{per capita physicians} + \beta_{43} \cdot \text{per capita pharmacists} + \sum_i \beta_{13} \cdot \text{cost containment policies} + \sum_t \beta_{13} \cdot \text{year dummy}_t + \epsilon_3
\]

The explanatory variables in this equation may be grouped into four categories: endogenous public policies, Medicaid population characteristics, access to providers, and state and federal cost containment policies.

Endogenous Public Policies. If states have fixed expenditure levels, increases in the number of drug recipients per capita put pressure on states to attempt to lower the amount of drug expenditures per drug recipient. In
contrast, higher pharmacy reimbursement rates are expected to increase the amount of drug expenditures per recipient.

**Medicaid Population Characteristics.** Medicaid population groups have different health problems and therefore different demands for drug benefits. We included three demographic variables to account for these utilization differences. The percentage of Medicaid recipients age twenty-one or younger within the state is expected to have a negative influence on per recipient drug expenditures because younger people consume fewer drugs than do other groups. The percentage of elderly state recipients is expected to have a positive influence on per recipient drug expenditures because the elderly consume more drugs than do other population groups. Similarly, we include the percentage of recipients who are blind or disabled to account for their differential use of services. Adults between twenty-two and sixty-four years of age constitute the comparison group. It is also possible that these variables proxy interest group effects. Kronebusch (1997) argues that the elderly are the most powerful interest group in the Medicaid program and that AFDC children are one of the weakest. If so, these interest group effects would reinforce the demand effects hypothesized for these variables.

In addition to differences in quantities demanded of prescription drugs, these groups also differ in terms of the types of drugs they use. States with a relatively high percentage of elderly will likely witness a relatively high utilization rate of, for example, cardiac drugs, holding all other factors constant. In 1996, Hawaii and New Mexico had, respectively, the highest (34%) and lowest (5.9%) percentages of elderly recipients of Medicaid prescription drugs; the states’ corresponding percentages of Medicaid cardiac drugs dispensed were 11.4 (Hawaii) and 5.7 (New Mexico), compared to the national average of 9.2. (National Pharmaceutical Council 1997; Health Care Financing Administration 1997). To the extent that these distinct groups systematically demand drugs of different types and costs, they will also affect Medicaid drug expenditures differentially.

**Provider/Interest Group Variables.** The number of physicians per capita and the number of pharmacists per capita are expected to have a positive effect on Medicaid per recipient drug expenditures for the same reasons they are expected to increase the number of drug recipients per capita.

**State and Federal Drug Cost Containment Policies.** During the 1980s and 1990s many states adopted various cost containment policies directed at
reducing the growth of Medicaid drug expenditures (Moore and Newman 1993). We control for the presence of restricted drug formularies, prior authorization, and cost-sharing arrangements. Restricted (or closed) drug formularies are lists of drugs that are reimbursable under Medicaid (Moore and Newman 1993). Drugs are included on the list based on their price and marginal health product (or therapeutic benefits). By eliminating high-priced drugs with little or no marginal health product, formularies can reduce the overall cost of the program. Prior authorization is defined by the National Pharmaceutical Council (1997) as a “process of obtaining prior approval as to the appropriateness of a service or medication” and does not guarantee reimbursement. The rationale and potential to generate savings are similar to that of restricted formularies. Indeed, in the case of restricted formularies, “approval” is required for drugs that are not included on the list. Two separate dummy variables indicating the use of restricted formularies or prior authorization are included in the model.

A third cost containment tool, widely used by public and private health insurance programs alike, consists of cost-sharing arrangements. A dummy variable indicating the presence of a state drug co-payment policy is included in the model. Two points relating to Medicaid prescription drug co-payments and their potential effectiveness as a cost containment tool are worth mentioning. First, Medicaid drug co-payment amounts were purposely kept at nominal rates. Second, and perhaps more important, various large segments of the Medicaid-eligible population are exempt from cost-sharing arrangements; these segments include pregnant women, children under eighteen years of age, hospital or nursing home patients, who are expected to contribute most of their income to institutional care, categorically needy recipients enrolled in HMOs, and recipients of emergency and family planning services.

During the time period of this study, a number of changes took place at the federal level, affecting all states. During the latter part of the 1980s, for example, changes in federal policies mandated increased services or patient coverage for all states. The study period also includes a shift in political power at the federal level, as the administration changed from Republican to Democratic control in 1992. Time-specific dummy variables for all years, except 1985 for contrast, are used to control for changes in federal policies and nationwide trends affecting all states. The time-specific dummy variables have a value of one for observations in the corresponding year and a value of zero otherwise. No signs are hypothesized for these controls.
Data and Estimation Methods

Data were collected for forty-seven states (see Table 1) covering a period of twelve years (1985 to 1996) and adding up to a total of 564 observations. Socioeconomic data were obtained from the Statistical Abstract of the United States. Medicaid prescription drug policy-specific data were 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 HCFA, including the Internet site www.hcfa.gov.com. Other sources include County Business Patterns, Medical Practice Data by Census Division, State, and County Group by the American Medical Association, and data collected by William J. Moore. The unit of analysis is the state. Missing observations for APhA membership and AMA membership were extrapolated using averages from previous and following years. For states using the variable dispensing fee method, the average reimbursement between the minimum and maximum is used. These states are then distinguished from those using a fixed rate system by a dummy variable.

The systems of equations are estimated simultaneously by three stage least squares, taking advantage of nonzero contemporaneous covariances between the disturbance terms (Zellner and Theil 1962; Judge et al. 1988; Greene 1990). This is particularly emphasized between the dispensing fee and percentage markup equations, as indicated by the results in the following section. Both systems are fully identified, implying consistent and efficient parameter estimates.

Each equation was tested for autocorrelation of the errors within states using the Durbin Watson statistic for panel data and corrected using the method described in Baltagi 1996. The strength of the instruments in the 3SLS estimation was tested based on the $F$-statistics of the first stage regressions. The first stage $F$-statistics for the profit, recipients to population ratio, and per recipient drug expenditures equations were, respectively, 17.39, 49.87, and 20.91, yielding potential biases of the 3SLS estimates of only 0.05, 0.02, and 0.03. The first stage $F$-statistics are significantly higher than 10 (see Staiger and Stock 1997).

3. 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. The time period of the study was determined mainly by the availability of data. For example, data on the number of licensed chain and community pharmacies in each state, which are reported by the National Pharmaceutical Council in their annual volume Pharmaceutical Benefits under State Medical Assistance Programs, exhibit an increasing number of elements.

4. Tests of the form $H_0 : \sigma_{ij} = 0$ were performed and rejected to support the 3SLS approach.
Empirical Results

Pharmacy Profit Equation

The results for the estimated total profit equation are shown in Table 3. As expected, the percentage APhA membership variable has a significant positive effect on total pharmacy profits. It would appear that state APhAs lobby effectively for their members. The results for the dispensing fee and percentage markup components are reported in Appendix B. APhA membership does not have a significant effect on either component. This result is to be expected. Several studies have noted the tendency for state Medicaid drug programs with high dispensing fees to have low percentage markups and states with low dispensing fees to have high percentage markups (Kreling 1991; Lamphere-Thorpe et al. 1994; Adams, Kreling, and Gondek 1994). This suggests that state decision makers simultaneously set the pharmacy reimbursement components. For this reason, dispensing fees and percentage markups were treated as joint endogenous variables in our expanded system. The results in Appendix B confirm a significant negative relationship between the dispensing fees and the percentage markup. The positive influence of APhA membership on total profit is the important finding. Participating pharmacies are likely to be more interested in total profit than in its components.

The drug recipient per capita endogenous variable has a significant positive effect on total pharmacy profit. While this finding supports the interest group argument that recipients favor higher reimbursement rates to assure greater access to providers, it is also possible that Medicaid recipients are a weak political group and that the causation runs in the opposite direction. That is, high reimbursement rates increase pharmacy participation in the Medicaid program, which reduces the access costs to recipients.

We find no evidence that the American Medical Association or the drug manufacturing industry influences Medicaid drug reimbursement rates. The estimated relationships are all negative, as predicted; however, none are statistically significant. Perhaps this is because such rates have only an indirect impact on these organizations’ welfare, at best. Similarly, neither of the political environment variables are statistically significant.

Drug Recipient to Population Ratio Equation

The regression results of the drug recipients to population ratio equation are summarized in Table 4. As anticipated, states providing higher reim-
bursement rates, as measured by total pharmacy profits, tend to have more Medicaid drug recipients per capita. These findings support the argument that higher reimbursement rates increase pharmacy participation and access to services, thus causing greater utilization rates as measured by the per capita recipient variable. This interpretation is reinforced by the results for the per capita pharmacist and per capita physician variables. Both of these variables have a significant positive effect on the per capita number of Medicaid drug recipients. Increases in the relative number of pharmacists or physicians raise their willingness to participate in the Medicaid program, thus reducing access costs and increasing the number of drug recipients per capita.

Finally, we find evidence of the trade-off between the “breadth” and “depth” of the Medicaid drug program discussed earlier. The significant negative coefficient associated with per recipient drug expenditures indi-
icates that states that devote more resources per recipient cover fewer recipients on average.

Drug Expenditures per Drug Recipient Equation

Table 5 summarizes the results of the drug expenditures per drug recipient equation. Contrary to expectations, higher pharmacy profits do not have a significant effect on per recipient drug expenditures. As just shown, higher per recipient drug expenditures were associated with fewer drug recipients per capita. This trade-off is symmetrical. In Table 5, the per capita drug recipients variable is negative and has a statistically significant influence on drug expenditures per drug recipient.

There is evidence that interest groups may indirectly impact drug
expenditures per drug recipient in ways other than through the pharmacy profit variable. Increases in the relative number of pharmacists have a significant positive impact on drug spending per drug recipient, presumably though their influence on access and utilization rates. These groups may also lobby for larger Medicaid drug budgets, which could increase both drug expenditures per drug recipient and the number of drug recipients per capita. The positive effects of the percentages of elderly and disabled recipients and the negative effect of the percentage of child recipients on drug expenditures per drug recipient are consistent with both the demand effects and relative lobbying strength of these two recipient groups. Finally, states that use prior authorization mechanisms and restricted drug formularies have significantly lower drug expenditures per recipient. In contrast, the co-payment variable is not statistically significant at any con-

### Table 5  Three Stage Least Squares Results for Per Recipient Drug Expenditures Equation

<table>
<thead>
<tr>
<th>Variable</th>
<th>Estimate</th>
<th>t-stat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total estimated profit*</td>
<td>0.0052</td>
<td>1.00</td>
</tr>
<tr>
<td>Drug recipients to population ratio*</td>
<td>−0.0160</td>
<td>−2.15</td>
</tr>
<tr>
<td>Per capita income</td>
<td>0.0147</td>
<td>2.33</td>
</tr>
<tr>
<td>Percentage AFDC recipients age 21-</td>
<td>−0.0035</td>
<td>−2.60</td>
</tr>
<tr>
<td>Percentage recipients age 65+</td>
<td>0.0119</td>
<td>5.22</td>
</tr>
<tr>
<td>Percentage disabled recipients</td>
<td>0.0079</td>
<td>1.54</td>
</tr>
<tr>
<td>Per capita physicians</td>
<td>0.0365</td>
<td>1.45</td>
</tr>
<tr>
<td>Per capita pharmacists</td>
<td>0.4505</td>
<td>3.79</td>
</tr>
<tr>
<td>Prior authorization dummy</td>
<td>−0.0846</td>
<td>−3.74</td>
</tr>
<tr>
<td>Formulary dummy</td>
<td>−0.1121</td>
<td>−2.84</td>
</tr>
<tr>
<td>Co-payment dummy</td>
<td>0.0258</td>
<td>0.64</td>
</tr>
<tr>
<td>Intercept</td>
<td>4.6051</td>
<td>35.13</td>
</tr>
<tr>
<td>1986 dummy</td>
<td>−0.0094</td>
<td>−0.26</td>
</tr>
<tr>
<td>1987 dummy</td>
<td>0.0114</td>
<td>0.31</td>
</tr>
<tr>
<td>1988 dummy</td>
<td>0.0311</td>
<td>0.84</td>
</tr>
<tr>
<td>1989 dummy</td>
<td>0.0125</td>
<td>0.32</td>
</tr>
<tr>
<td>1990 dummy</td>
<td>0.0405</td>
<td>0.87</td>
</tr>
<tr>
<td>1991 dummy</td>
<td>0.0329</td>
<td>0.68</td>
</tr>
<tr>
<td>1992 dummy</td>
<td>0.0774</td>
<td>1.56</td>
</tr>
<tr>
<td>1993 dummy</td>
<td>0.1269</td>
<td>2.45</td>
</tr>
<tr>
<td>1994 dummy</td>
<td>0.1675</td>
<td>3.18</td>
</tr>
<tr>
<td>1995 dummy</td>
<td>0.2795</td>
<td>5.10</td>
</tr>
<tr>
<td>1996 dummy</td>
<td>0.3289</td>
<td>5.99</td>
</tr>
</tbody>
</table>

*Endogenous.
Conclusions and Policy Implications

Medicaid prescription drug reimbursement rates decreased substantially during the late 1980s and early 1990s, as states increased their efforts to contain costs. To better understand the process underlying Medicaid rate-setting policies, we developed a model consisting of three equations, estimated jointly to account for simultaneity and feedback effects between (a) prescription drug reimbursement levels, (b) the number of drug recipients per capita, and (c) the drug outlays per drug recipient. We find evidence that provider and recipient interest groups have significant influence on Medicaid pharmacy reimbursement rates, the number of drug recipients per capita, and the amount of drug expenditures per recipient. Specifically, the percentage of pharmacists belonging to the state American Pharmaceutical Association (APhA) has a strong positive impact on reimbursement levels, which, in turn, have a significant positive effect on the number of drug recipients per capita and per recipient drug expenditures. The joint estimation also clearly illustrates a symmetric trade-off between the depth and the breadth of state Medicaid prescription drug programs. The estimated elasticity coefficients of the total estimated profit with respect to the percentage of APhA membership based on average membership is 2.12. This implies that states with 1 percent above-average strength of the APhA have increases of 2.12 percent or $0.74 per drug (using the average nominal price in 1996). Using the average number of prescription drugs dispensed per state in 1996, this would amount to an increase of $5.35 million in Medicaid drug reimbursements.

The positive effect of reimbursements on the number of drug recipients per capita and drug expenditures per drug recipient is consistent with Adams and Gavin’s (1996) weak evidence that higher reimbursement rates increase pharmacy participation rates, leading to better access to services. We also find that increases in the per capita number of pharmacists and

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5. Relevant averages during the study period were: APhA membership (30.69%), total profit per Medicaid drug as a percentage of the price (-0.73%), nominal drug price in 1996 ($35), Medicaid drugs dispensed per state ($7.2 million).
6. In this regard, Sloan, Mitchell, and Cromwell (1978) show that higher physician fees increase physician participation in state Medicaid programs.
physicians have a significant positive effect on drug expenditures per drug recipient and on the number of drug recipients per capita. This supports Sloan, Mitchell, and Cromwell’s (1978) argument that greater provider competition increases provider participation in the Medicaid program. Finally, we showed that the number of drug recipients per capita has a significant positive effect on Medicaid pharmacy reimbursement rates. While this result is consistent with the argument that recipients favor higher reimbursement rates to improve access to program services, it is also possible that the causation between these variables runs in the opposite direction and that Medicaid recipients are a politically weak group.

Our findings have important implications for the Medicaid program and its beneficiaries. Initially, the federal government established a minimum level of services that must be covered by state programs to ensure some equality regarding the medical treatment of the indigent across the nation (Gurny, Hirsch, and Gondek 1992). Many studies have documented and tried to explain the variation in the coverage of services and the treatment of the poor under Medicaid across the states (Granneman 1980; Holahan and Cohen 1986; Cromwell, Hurdle, and Wedig 1986; Pine, Clauser, and Baugh 1992; Wade and Berg 1995; Cromwell et al. 1997). A few of these studies have alluded to the importance of interest groups in explaining this variation, but this is the first study to document the importance of specific interest groups for a particular Medicaid service. There is every reason to believe that other interest groups influence reimbursement rates, utilization rates, and expenditures for other Medicaid services. In this case, the trend toward devolution, or granting individual states greater control of their Medicaid programs, has important implications concerning equality and adequacy of medical care for the poor across the nation. The level of government, federal or state, that controls the Medicaid program has important implications for the influence of special interest groups, which depends, among other factors, on the relative strength and number of competing groups (Becker 1983). This study highlights the role of particular interest groups in matters that affect a public health program that serves approximately 34 million low-income people. The influence of particular special interest groups is likely to increase with a shift in control from the federal to the state level. To the extent that these groups influence different aspects of the Medicaid program, both directly and indirectly, their relative strengths also affect the adequacy, quality, and equality of services provided to the eligible population.
Appendix A: Sources of Pharmacy Profit—The Dispensing Fee and Percentage Age 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.

\[ \text{Dispensing fee} = (\text{Cost of dispensing}) + \pi \]  

Medicaid reimbursement of dispensing fees can be based on either a fixed fee or a variable fee structure. The fixed fee method, used by the majority of states, provides an identical dispensing fee to all participating pharmacists (Table 3). 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 that are due to, for example, geographic locations (rural versus metropolitan) (see Kiefer 1979: 5), 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. 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,7 and the categorically variable fees, which distinguish pharmacists according to their location, type of ownership, and type of pharmacy.

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

7. Adjustments are made to the cost of operations to account for such concepts as overhead cost, location, and volume.
acquiring reliable data to calculate the AAC, states have used the latter
two methods to estimate acquisition costs as an alternative. However, nei-
ther the AWP nor the WAC represent an accurate or direct measure of
actual acquisition costs.

Ordinarily, the AWP is an average representing the suggested whole-
sale price to the pharmacy and does not account for discounts that the
pharmacist may obtain (for example, through large quantity or direct
purchases). These discounts range from 10 to 18 percent with an average
of 16 (Adams, Kreling, and Gondek 1994). Thus, on average,

\[ AAC = AWP - 16\% \]  \hspace{1cm} \text{(viii)}

States customarily deduct an estimated percentage, \( \hat{D} \), from the AWP to
account for this difference and determine a level of reimbursement that is
closer to the AAC. The remaining difference between the rate at which
states reimburse pharmacists and the AAC represents a second source of
profits for the pharmacist and in this article is called the percentage
markup. The percentage markup associated with this method is calculated
as

\[ \% \text{MARKUP} = 16\% - \hat{D} \]  \hspace{1cm} \text{(ix)}

For example, for Alaska, \( \hat{D} = 5\% \), implying an estimated percentage
markup of 11 percent.

On the other hand, for states that use the WAC measure, the percent-
age markup is calculated as follows. Wholesalers generally add an esti-
imated 3.39 percent to the wholesale acquisition cost to derive the price
of prescription drugs that they charge to pharmacists. Thus, to pharma-
cists

\[ AAC = WAC + 3.39\% \]  \hspace{1cm} \text{(x)}

Medicaid reimbursement of prescription drugs adds a percentage markup
to the WAC, say \( \hat{M} \), to account for the markup by wholesalers. Thus, phar-
macists get an ingredient reimbursement (IR) equal to

\[ IR = WAC + \hat{M} \]  \hspace{1cm} \text{(xi)}

Using (x) and (xi), the percentage markup enjoyed by pharmacists under
this method, \( IR - AAC \), is

\[ \% \text{MARKUP} = \hat{M} - 3.39\%. \]  \hspace{1cm} \text{(xii)}
Accordingly, for Florida, \( \hat{M} = 7\% \), yielding a percentage markup of 3.61 percent. Table 2 contains a list of states and the methods they employed in 1994 to obtain the ingredient reimbursement basis.

**Total Pharmacy Profit**

The dispensing fee includes both the cost of dispensing (COD) and a net profit per drug. Using the 1991 estimates published by Adams, Kreling, and Gondek (1994), the cost of dispensing as a percentage (\( CODPC \)) of the dispensing fee (\( DF \)) is obtained for 1991. The net profit from dispensing as a percentage of the average drug price is then calculated as

\[
\left( 1 - \frac{CODPC}{DF} \right) \times 100 \%
\]

We assume that this \( COD \) to \( DF \) ratio is relatively constant over time. The average real net profit from the dispensing component of a Medicaid drug over the 1985–1996 period is -9.6 percent.

The percentage markup is initially estimated relative to the actual acquisition cost (AAC). Again, using the estimates of the AAC provided by Adams, Kreling, and Gondek, the markup as a percentage of the average price is derived as

\[
\left[ \frac{\% \text{ Markup}}{\text{PRICE}} \times \frac{AAC}{\text{PRICE}} \right]
\]

The average markup relative to the price for the 1985 to 1996 period is 8.9 percent. When combined with the negative dispensing fee net profit, this yields a mean estimated total real profit of –0.7 percent of the average price. This average was derived after the dispensing fee and cost of dispensing were deflated using the all-item consumer price index. The acquisition cost and drug price were deflated using the drug price index. This negative number corresponds with the findings of Adams, Kreling, and Gondek for 1991, who point out that negative profit from dispensing Medicaid drugs does not imply overall negative profit since pharmacies serve a variety of clientele. It is noteworthy that the nominal total profit for this period was positive, although declining throughout most of the period. In 1985 and 1994 the nominal net average profit was approximated at, respectively, 5.42 and 0.41 percent.
### Table B1  Three Stage Least Squares Regression Results for Profit Component Equations

<table>
<thead>
<tr>
<th>Variable</th>
<th>Dispensing Fee Estimate ($t$-stat)</th>
<th>Percentage Markup Estimate ($t$-stat)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net profit in dispensing fee (percentage of average price)*</td>
<td>$-0.1874$ ($-8.20$)</td>
<td></td>
</tr>
<tr>
<td>Markup as percentage of average price*</td>
<td>$-0.0090$ ($-6.24$)</td>
<td></td>
</tr>
<tr>
<td>Per recipient drug expenditures* and tax price interaction</td>
<td>$-0.1098$ ($-5.07$)</td>
<td>$-2.1198$ ($-3.20$)</td>
</tr>
<tr>
<td>Drug recipients to population ratio*</td>
<td>$-0.0072$ ($-3.62$)</td>
<td>$0.2108$ ($2.91$)</td>
</tr>
<tr>
<td>Percentage APhA membership</td>
<td>$-0.0004$ ($-1.33$)</td>
<td>$0.0220$ ($1.69$)</td>
</tr>
<tr>
<td>Percentage AMA membership</td>
<td>$0.0012$ ($4.73$)</td>
<td>$0.0153$ ($1.34$)</td>
</tr>
<tr>
<td>Percentage drug manufacturing base</td>
<td>$0.0236$ ($1.60$)</td>
<td>$-0.1271$ ($-0.21$)</td>
</tr>
<tr>
<td>Percentage chain pharmacists</td>
<td>$0.0003$ ($0.97$)</td>
<td>$0.0266$ ($2.19$)</td>
</tr>
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<td>Fixed dispensing fee dummy</td>
<td>$0.0239$ ($3.09$)</td>
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</tr>
<tr>
<td>1986 dummy</td>
<td>$0.0459$ ($2.61$)</td>
<td>$0.3459$ ($0.46$)</td>
</tr>
<tr>
<td>1987 dummy</td>
<td>$0.0484$ ($2.78$)</td>
<td>$0.0642$ ($0.08$)</td>
</tr>
<tr>
<td>1988 dummy</td>
<td>$0.0434$ ($2.55$)</td>
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</tr>
<tr>
<td>1989 dummy</td>
<td>$0.0372$ ($2.26$)</td>
<td>$-1.1864$ ($-1.57$)</td>
</tr>
<tr>
<td>1990 dummy</td>
<td>$0.0184$ ($1.20$)</td>
<td>$-3.2328$ ($-4.28$)</td>
</tr>
<tr>
<td>1991 dummy</td>
<td>$0.0151$ ($0.98$)</td>
<td>$-3.5031$ ($-4.61$)</td>
</tr>
<tr>
<td>1992 dummy</td>
<td>$0.0206$ ($1.35$)</td>
<td>$-3.3439$ ($-4.39$)</td>
</tr>
<tr>
<td>1993 dummy</td>
<td>$0.0243$ ($1.59$)</td>
<td>$-3.5511$ ($-4.6$)</td>
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Table B1  (continued)

<table>
<thead>
<tr>
<th></th>
<th>Coefficient</th>
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<td></td>
<td>(0.58)</td>
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<td>(1.19)</td>
<td>(–5.52)</td>
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*Endogenous.

References


