# Does Utility-Maximizing Behavior by States Explain Programmatic Design? A Longitudinal Analysis of Medicaid, 1977-2004

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**Abstract**

This article examines the variation in how Medicaid funds are spent by states. The heterogeneity of participants in terms of age, disability, and medical care cost motivates our exploration of the tradeoffs states make in allocating Medicaid spending between the old, the disabled, and the young low-income populations served by the program. We apply the demand system of Deaton and Muellbauer (1980) to distinguish between state demand at the intensive (benefit) and extensive (eligibility) margin of program design. The empirical framework is subsequently used to test the null hypothesis that utility-maximizing behavior explains the division of state Medicaid spending between the recipient populations. We utilize the parameter estimates of the demand system to simulate how federal policy changes such as eligibility expansions can affect the design of the program by changing the relative price states pay for benefit provision. Our estimates suggest that a move to "universal" eligibility under Medicaid would result in states substituting the benefits of the young population for those of the disabled.

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## I. Introduction

For over a half-century, Medicaid has provided insurance to eligible U.S. residents covering the purchase of all major categories of medical care. The marked growth in the program's cost over time has drawn considerable attention. Total federal and state spending on Medicaid has grown by more than 100% over the past decade to nearly US$330 billion in 2007.[1] Rising cost has also led to the program making up an increasingly larger share of state budgets; from an average of almost 8% of state government current expenditures in 1977 to 20% in 2004. While the rise in aggregate spending on Medicaid has been rapid and large, it also overshadows extensive adjustments that have taken place in the design of the program by states. Underlying the growth in cost has been a change in the size of low-income populations predominantly served by Medicaid and in the cost of medical care the different participants demand.

Medicaid participants, unlike other federal-state welfare programs, comprise the separate populations of the old, the disabled, and the young.[2] The average cost of benefits for an old or disabled participant is approximately seven times the cost of a young participant, although this difference in cost has also grown over time. Our analysis of Medicaid spans fiscal year 1977-2004, and over this period we observe distinct change in state programmatic design. Table 1 presents average characteristics of the program by recipient population. Spending on the old declined from 39% of total Medicaid expenditures to 24%. Meanwhile, spending on the disabled increased from 30% to 44%. We also see a decline in old recipients per capita and growth in disabled. Why did states shift from favoring the old to the disabled in a matter of 28 years? In

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[1] See Table 3 at http://www.cms.hhs.gov/NationalHealthExpendData/downloads/tables.pdf

[2] Old participants are 65 years old or older. Disabled participants also include those who are blind. Young participants include children as well as caretaker relatives or pregnant women who are not old, blind, or disabled; after 2000, it also includes women who are eligible under the Breast and Cervical Cancer Prevention and Treatment Act of 2000. See Schneider et al. (2002) for a comprehensive overview of the Medicaid program.

this research we attempt to answer this question and perhaps shed light on what programmatic change we might observe in the coming years.

Despite certain federal guidelines, key issues of programmatic design such as eligibility and benefits (expenditures per recipient), have largely been devolved to states. For example, the federal government mandates that certain low-income residents must be eligible (e.g. recipients of Supplemental Security Income (SSI)), however, program eligibility is means-tested and the standards and methodology used for these tests are chosen by state governments.[3] States are also granted considerable discretion over benefits. Although the federal government mandates that certain services be provided (e.g. hospital and physician services), states can choose payment rates for these services and other optional services (e.g. rehabilitation therapies and eye and dental care). In general, there are very few federal rules regarding payments to medical care providers, and identifying the effects of payment rate levels has received considerable attention by researchers.[4] What is important for our analysis is that states can choose many aspects of the program's design and it is an empirical question as to how states decide which populations to spend more or less on and whether eligibility or benefits change in response to cost.

The evidence to date suggests states choose to emphasize relatively less expensive alternatives in the design of cash assistance welfare programs (Ribar and Wilhelm 1999; Baicker 2005). That is, in response to a reduction in the federal matching rate or an increase in the take-up of welfare states reduce recipient benefits, on average. In the context of Medicaid, the

[3] The income and resource tests each have a standard and methodology. A standard is a particular level, below which an individual is deemed eligible. A methodology is the way in which an individual's income and resources are counted for the purposes of applying the standard.

[4] Research on the effects of relative increases in Medicaid physician payment levels has found that the prevalence of unfavorable health outcomes such as infant mortality (Currie et al. 1995) and low birth weight (Gray 2001) is reduced, and that private physicians respond by devoting a larger share of their practice to treating Medicaid patients (Baker and Royalty 2000). Decker (2007) find higher payments increase both the number of private physicians willing to treat Medicaid patients and the length of patient visit times with physicians while Gruber et al. (1999) find that physicians are more likely to increase the treatment intensity. Grabowski et al. (2004) find a positive relationship between Medicaid payment rates and risk-adjusted nursing home quality measures.

potential substitution between benefits on the one hand and eligibility on the other is much more complex. The heterogeneity in the low-income populations served by Medicaid suggests potential tradeoffs in expenditure allocation can occur between populations as opposed to strictly within one population. This research takes a first step in investigating the extent to which states change spending on one participant population at the expense of others, and whether the adjustments are consistent with a model assuming utility-maximizing behavior of states.

In particular, we take advantage of state-level data on Medicaid expenditures and recipient rates for the old, the disabled, and the young over the period 1977-2004 to model the effect of differential recipient rates on the share of total Medicaid spending by population group. We find that, on average, states respond to a 10% increase in old or young recipients per capita by reducing the total spending on young or old recipients by about 1% (12.5 million dollars), respectively. Recipient increases for the disabled do not result in changes in spending on the alternative populations. More importantly, however, these aggregate changes in total spending on each population hide tradeoffs states make between eligibility and benefit levels. Estimates of compensated price elasticities of demand indicate that Medicaid benefits are net substitutes for eligibility between the old and the disabled populations and between the disabled and the young populations. There is no statistically significant relationship between benefits and eligibility for the old and young populations. The findings also suggest that any expansion in eligibility for the young Medicaid recipient population, such as a move to universal health care coverage, will result in decreases in benefits for the young and increases in benefits for the disabled.

The paper proceeds as follows. Section II outlines an empirical model of Medicaid demand which distinguishes between recipient populations and programmatic design. Section III presents our data and the results are discussed in Section IV. Section V concludes.

## II. Modeling Medicaid Programmatic Change

Previous empirical research on Medicaid design has been concerned with explaining the program's total expenditures or enrollments separately (see Adams and Wade (2001) for a recent investigation of both). While this approach is informative from a policy standpoint, it leaves many interesting questions regarding the design of the program unanswered. For example, if enrollments rise do states adjust benefit levels to help control cost? Similarly, are changes in Medicaid spending distributed equally between recipient populations? Designing means-tested welfare programs involves determining the benefit levels for individuals who are eligible on the one hand and the scope of welfare eligibility on the other. The tradeoff between these two programmatic dimensions has received little attention in prior studies of the Medicaid program. This is in contrast to studies of cash assistance welfare programs such as Aid to Families with Dependent Children (AFDC). Researchers investigating the generosity of AFDC have long focused on assessing how sensitive states are to the costs of each. Baicker (2005) find evidence of willingness on the part of states to substitute intensive (benefit) for extensive (eligibility) generosity, and vice versa, depending on the cost of one relative to the other.[5] To answer these questions and bridge the gap between research investigating the design of AFDC and Medicaid programs, we need an empirical framework that accounts for multiple recipient populations.

### Empirical Framework

The Almost Ideal Demand System (AIDS) of Deaton and Muellbauer (1980) is particularly useful for our purposes here. In this framework, budget shares are specified as a function of prices and the budget level. Previous studies of Medicaid spending treat the state

[5] See Ribar and Wilhelm (1999) for a summary of the earlier studies on this topic and a very thorough sensitivity analysis regarding different empirical models.

government budgetary process as "multilevel." That is, the determination of aggregate Medicaid spending precedes or is otherwise independent of the determination of how the funds are allocated between recipient populations. The AIDS allows us to take this assumption as a starting point, and apply an estimation strategy that obtains consistent parameter estimates of the price coefficients whether this assumption is true or not.

The standard AIDS demand functions form the basis of our analysis.[6] We estimate regressions which take the following form:

$$budget\ share_{ist} = \sum_j \gamma_{ij} \ln price_{jst} + \beta_i \ln(budget_{st}/index_{st}) + \boldsymbol{X_{st}}\Lambda + \alpha_{is} + \tau_{it} \qquad (1)$$

where, for state *s* during fiscal year *t*, the share of Medicaid spending allocated to recipient population *i* is specified to depend on the natural log of each recipient population's price, total per capita Medicaid spending deflated by a state-specific demand system price index, a vector of time varying state environment characteristics, and state-recipient population and time-recipient population fixed effects.[7]

For comparability, the price of Medicaid benefits is defined as in similar studies of cash assistance welfare program design. The price of an additional dollar spent on Medicaid benefits is equal to recipients per capita net of the portion of state Medicaid expenditures matched by the federal government.[8] Decomposing state spending on welfare programs into two dimensions, benefits per recipient and recipients per capita, can uncover adjustments that aggregate analyses fail to (Baicker 2005). For example, the estimated coefficients on log prices indicate the change

[6] Details on the derivation of AIDS are presented in Deaton and Muellbauer (1980).
[7] We use the commonly applied Stone's (1954) price index. All price indices are strongly correlated with one another and when we try alternative indices the results are similar. Using Monte Carlo simulation techniques, Alston et al. (1994) find this index produces more accurate estimates than alternative indices.
[8] A state's share is calculated by multiplying 0.45 times the square of the ratio of state per capita income to national per capita income averaged over three years. The federal government pays the remaining balance with the match being bounded between 50% for the highest income states and 83% for the lowest income states.

in the proportion of Medicaid spending on each recipient population due to a change in recipient levels (or the federal matching rate), however, the effects on aggregate spending may only be part of the adjustment by states. A measure of how spending on benefits changes as a result of a change in the cost of recipients, and vice versa, would provide for a much clearer understanding of programmatic change. Average compensated price elasticities of demand can be determined under the AIDS framework from the parameter estimates in equation (1) and take the following form:

$$elasticity\ of\ benefits_{ij} = \frac{\partial \ln benefits_i}{\partial \ln recipients_j} = -\delta_{ij} + \frac{\gamma_{ij}}{budget\ share_i} + budget\ share_j \quad (2)$$

where $\delta_{ij}$ is the Kroenecker delta such that $\delta_{ij} = 1$ for *i*=*j* and $\delta_{ij} = 0$ otherwise. The price elasticity of recipients with respect to the cost of benefits can be obtained by taking the reciprocal of equation (2) above.[9]

**<u>Estimation and Identification</u>**

As with state design of AFDC, we have two sources of potential endogeneity bias that must be addressed if estimates are to provide policy guidance. Take-up of the Medicaid program can depend on unobservable characteristics of the low-income resident population in a state. Differences in utilization of medical care services, for example, could lead certain eligible populations to respond to the benefits provided through Medicaid. On the other hand, states are simultaneously determining both dimensions of programmatic design for each population.[10] To remove the potential bias from these sources, we adopt an instrumental variables strategy and

[9] See Pashardes (1993) for details on the derivation and why alternative methods of calculation can lead to bias when using Stone's (1954) price index.

[10] We perform tests of endogeneity and reject the null hypothesis that recipient take-up is exogenous. The results for these tests and other common instrumental variables specification tests are reported in Table 8.

utilize the standard generalized method of moments (GMM) estimator. The GMM estimator is preferred in this setting because subsequent specification tests are robust to hetroscedasticity.

To identify the model we rely on state-time varying measures of resident participation in welfare programs strictly administered by the federal government and uniformly applied across all states. These include old SSI recipients per capita, blind-disabled SSI recipients per capita, and Food Stamp Program recipients per capita. To improve efficiency and perform tests of overidentification we construct one measure of the overall trend in Medicaid recipients for each state. Following a similar strategy as Baicker (2001) in the context of medical care costs, we take the average level of Medicaid recipients per capita the year before our analysis begins and interact this value with the national growth rate in Medicaid recipients for subsequent years. This instrument relies on the differential impact that the national trend in Medicaid recipient levels has on states' programs relative to their initial eligibility generosity. States with generous eligibility criteria would be affected more relative to states with stringent criteria.

## Testing for Utility-Maximizing Behavior by States

The empirical model of Medicaid demand based on the AIDS and specified in equation (1) does not impose any constraints on the estimated parameter values. That is, the resulting estimates may or may not be consistent with an underlying model of demand for Medicaid that assumes utility-maximizing behavior by states. What motivates state behavior when changing the programmatic design of Medicaid? The AIDS framework can help provide an answer to this question. For example, if a utility function for states' Medicaid spending exists it depends directly on the benefit levels of each recipient population given the way we have defined prices. If states act "as if" maximizing Medicaid utility subject to an expenditure constraint, then on average we would expect to observe certain consistent relationships. Three properties of demand functions implied by behavior consistent with utility maximization are homogeneity, symmetry, and negativity. While homogeneity is a direct consequence of specifying a linear budget constraint, symmetry and negativity hold if preferences are consistent with the axioms of rational choice (Deaton and Muellbauer 1980b). The parameter estimates recovered using the AIDS framework allows us to test the null hypothesis that the first two properties hold and provide suggestive evidence regarding the third.

In particular, a Chi-square statistic testing the property of homogeneity is constructed based on the following constraint:

$$\sum_{j} \gamma_{ij} = 0 \quad \forall\, i$$

A failure to reject the null would suggest the units in which prices are measured have no influence on state programmatic design of Medicaid in this context beyond determining the budget constraint. Similarly, a Chi-square statistic testing the property of symmetry is constructed based on the following constraint:

$$\gamma_{ij} = \gamma_{ji} \quad \forall\, i \text{ and } j$$

A failure to reject the null would suggest states are making consistent programmatic design choices in response to changes in relative prices. Lastly, we construct a matrix of normalized compensated price elasticities of demand where the $(i, j)$th term takes the form:

$$c_{ij} = budget\ share_i * elasticity\ of\ benefits_{ij}$$

and calculate the eigenvalues to check for the property of negativity. The eigenvalues of this matrix have the same sign as the underlying Slutsky substitution matrix (Deaton and Muellbauer 1980a, b). The property of negativity follows from the concavity of the expenditure function in prices, and implies that for an increase in price, holding utility constant, demand must fall or at least remain unchanged for the good whose price increases.

## III. Data

Data from a number of sources are utilized in the empirical model to control for exogenous factors which are likely to influence state Medicaid spending. Table 2 presents the sample means of state characteristics for fiscal year 1977-2004. A brief description of the data source and variables constructed is provided below.

### State Government Medicaid Programs

Data on state government Medicaid expenditures and recipients come from the Health Care Financing Administration (HCFA) 2082 forms for fiscal year 1977-1998. As of fiscal year 1999, all states are required to submit Medicaid expenditure and recipient information via the Medicaid Statistical Information System (MSIS). Due to missing Medicaid program data and other considerations discussed below, panel data for 48 states are assembled spanning fiscal year 1977-2004. Arizona is excluded from our sample because it has operated under a 1115 waiver since it began its Medicaid program in 1982 and does not show up in the HCFA 2082 reports until 1991. Hawaii is not included because they have implemented a universal health care program and the reported Medicaid expenditure and recipient data conflates Medicaid data with universal health care data (Kousser 2002). The federal medical assistance percentages used to calculate the state share of total Medicaid expenditure are obtained from the Green Book. Expenditure values are adjusted by the consumer price index (CPI) indexed in 1983-84 dollars.

**State Environment**

Data on the partisan affiliation of state governors, the partisan composition of state legislatures, and the fraction of the state legislature which is affiliated with the Democrat party is obtained from the National Conference of State Legislatures for the entire sample period. We utilize this information to define dichotomous variables equal to one if a state has a unified Democratic state legislature, a divided state legislature, a Democratic state governor, and an Independent state governor. The omitted categories captured in the constant term reflect a unified Republican legislature and a Republican governor, respectively.

To control for general state demographic characteristics representative of the taxpayer and target populations of Medicaid we use the percent of the state population that is female and between the ages of 15 and 44, the percent of the state population age 14 or younger, and the percent of the state population age 65 or older reported by the U.S. Census Bureau. State annual unemployment rates from the U.S. Bureau of Labor Statistics are used to control for cyclical economic factors affecting Medicaid spending. To control for the underlying prices of medical care, as well as the propensity of people to utilize medical care, a variable measuring state specific Medicare expenditure per recipient is constructed from data obtained from the U.S. Department of Health and Human Services.

Lastly, participation data is employed from three separate federally controlled low income assistance programs and used as instrumental variables for Medicaid recipient levels in each population. State specific data is collected on Supplemental Security Income (SSI) recipients from the U.S. Social Security Administration to construct per capita measures of elderly SSI and blind disabled SSI recipients. Additionally, a per capita measure of Food Stamp Program participants is constructed with data obtained from the U.S. Department of Agriculture.

## IV. Results

Estimates of the AIDS demand functions specified in equation (1) for the old, disabled, and young Medicaid recipient populations are presented in Table 3. Changes in relative prices of benefit provision for the three populations work through the coefficients on the price variables. Each coefficient indicates a hundred times the effect on the *i*th budget share of a 1%increase in the *j*th price, holding deflated per capita state Medicaid spending constant as well as a number of state environment characteristics. A 10% increase in the price of benefits for the old results in a 0.89% increase, a 0.19% increase, and a 1.15% decrease in the share of Medicaid spending on the old, disabled, young Medicaid recipient populations, respectively. We fail to reject the null hypothesis of equal and opposite adjustments in the allocation of Medicaid spending due to an increase in the price of benefits for the young recipient population.

To help place the estimates of state spending response in perspective, Table 4 reports the dollar change in spending on the three populations as a result of one additional recipient taking-up Medicaid. We see the same direction in changes of spending predicted by the coefficient estimates in Table 3, although the level changes in spending are much larger for the old relative to the young. This stems from the fact that the young recipient population has a much larger recipient rate relative to the alternative populations. Average per capita recipient rates for the young are more than four times that of the old and disabled (see Table 2). Interestingly, state Medicaid spending on the disabled is less responsive to price, both in terms of magnitude and statistical significance, relative to the old and the young recipient populations.

To explore state spending response further we utilize the parameter estimates and sample mean budget shares to calculate the compensated price elasticities of demand for Medicaid benefits defined in equation (2). The price elasticities are presented in Table 5 and we see that aggregate changes in spending on the recipient population overshadow significant adjustment by states in benefit provision. Increases in the recipient rate of each population results in states reducing spending on benefits for that population. The response is significantly negative and significantly inelastic implying that states decrease spending on benefits by 4.0%, 6.8%, and 4.1% in response to a 10% increase in the recipient rates of the old, disabled, and young, respectively. Furthermore, the estimated cross-price elasticities between the old and disabled and the disabled and young are significantly positive indicating states view Medicaid benefits as net substitutes for eligibility, and vice versa, for these recipient populations.

To emphasize the importance of decomposing state Medicaid spending adjustments we present calculations of the substitution effect component of state response to the price of Medicaid Benefits in Table 6. Relative to the aggregate changes in state spending reported in Table 4 for the same changes in recipient rates, we see marked differences in the direction of adjustment. For example, an additional recipient from the old population results in states spending $4,119 more on the old overall, however, spending fell by $4,521 on benefit provision for the old. Similar differences are evident for the young recipient population as well. Moreover, while no statistically significant change in spending on the disabled was found in response to disabled take-up, the substitution effect indicates states reduce spending on their benefits to help offset the cost of an additional recipient.

## <u>Evidence of Utility-Maximizing Behavior by States</u>

As previously discussed, there is interest in understanding what motivates state behavior when changing the programmatic design of Medicaid. Is a model assuming utility-maximizing behavior by states supported by the data? In Table 7 we present evidence on three properties of demand we would expect to observe if this assumption were true. First, all eigenvalues of the Slutsky substitution matrix are negative which suggests the negativity property holds. Second, the p-value testing the joint null hypothesis that the property of symmetry is true is 0.6008 and well within conventional levels of significance. Third, the p-value testing the joint null hypothesis of the property of homogeneity indicates the same. Taken together, the results provide strong evidence that utility-maximizing behavior by states underlies the programmatic design of Medicaid.

## V. Conclusions

This paper explores in detail how Medicaid funds are spent by states on the old, disabled, and young recipient populations of the program. A 28 year panel of states is used to model state Medicaid spending on the three populations and explain the distinct change in programmatic design we observe over this period as state spending shifted away from the old towards the disabled. The analysis is the first to systematically investigate the extent to which aggregate changes in Medicaid spending overshadow the responsiveness of states to the cost of alternative dimensions of program design.

The AIDS framework is applied to distinguish between state demand for the three populations at the intensive (benefit) and extensive (eligibility) margin. Estimates suggesting that states substitute spending on the young with the old in response to an increase in the recipient rate of the old, and vice versa, are found to tell only part of the story. Hidden within these aggregate changes in spending on the recipient populations are tradeoffs states make in spending on benefits as opposed to eligibility. Compensated price elasticities indicate states have an inelastic demand for benefits and thus, on average, reduce spending on benefits for populations whose take-up increases.

The implication is that while spending on one population rises, it could also hide cuts in benefits. These cuts could involve a reduction in medical care services covered under Medicaid or, perhaps more importantly, reductions in payment rates to providers. There is a large literature documenting adverse health outcomes for Medicaid recipients as a consequence of lowering payment rates to providers. Understanding how states adjust both margins of the program's design is necessary for predicting how demographic changes in the population can impact the quality of medical care provided through Medicaid. Our findings suggest that, on average, states are sensitive to the relative cost of each.

Lastly, we take of advantage of the AIDS to help shed light on what underlies state behavior in the design of Medicaid. We investigate whether three properties of demand are evident: negativity, symmetry, and homogeneity. We find they are, and conclude that utility-maximizing behavior characterizes programmatic design in this context. Our findings are not sensitive to the multilevel budgeting assumption that most research on Medicaid takes as a starting point, although more accurate predictions of state spending response would be possible if we had a clearer understanding of the income effects associated with changes in the price of welfare. Future research investigating the income effects of Medicaid would be useful from a policy standpoint.

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**Table 1**
Real Change in State Medicaid Program Characteristics by Recipient Population

| | Fiscal Year 1977 | | | Fiscal Year 2004 | | | Percent Change | | |
|---|---|---|---|---|---|---|---|---|---|
| | Medicaid Recipient Population | | | Medicaid Recipient Population | | | | | |
| | Old | Disabled | Young | Old | Disabled | Young | | | |
| Share of State Medicaid Budget | 0.39 | 0.30 | 0.31 | 0.24 | 0.44 | 0.32 | -38 | 47 | 3 |
| | (0.09) | (0.06) | (0.08) | (0.05) | (0.05) | (0.06) | | | |
| Medicaid Recipients Per Capita | 0.016 | 0.011 | 0.057 | 0.014 | 0.027 | 0.124 | -13 | 145 | 118 |
| | (0.009) | (0.005) | (0.025) | (0.005) | (0.014) | (0.037) | | | |
| Medicaid Benefits Per Recipient | 1,026 | 1,149 | 201 | 28,295 | 28,004 | 4,064 | 2,658 | 2,337 | 1,922 |
| | (467) | (578) | (60) | (9324) | (8978) | (1254) | | | |

Notes: Sample means reported for data from all U.S states except AZ and HI for FY 1977 and 2004. Standard deviations reported in parentheses, and benefit expenditures adjusted for inflation using the CPI in 1983-84 dollars.
Sources: Medicaid data from HCFA 2082 forms through FY1998 and MSIS system thereafter; state population data from the U.S. Census Bureau

**Table 2**
Sample Means of Selected State Characteristics for Fiscal Year 1977-2004

| | Mean | SD |
|---|---|---|
| **Medicaid Variables** | | |
| State Medicaid Budget | 1,249,314,059.65 | 2815301930.54 |
| Per Capita State Medicaid Budget | 200.52 | 213.97 |
| Budget Share of Old Recipient Population | 0.33 | 0.09 |
| Budget Share of Disabled Recipient Population | 0.39 | 0.07 |
| Budget Share of Young Recipient Population | 0.28 | 0.08 |
| Price of Benefits for Old Recipient Population | 0.0052 | 0.0021 |
| Price of Benefits for Disabled Recipient Population | 0.0065 | 0.0035 |
| Price of Benefits for Young Recipient Population | 0.0294 | 0.0139 |
| Benefits for Old Recipient Population | 11,274.92 | 9484.97 |
| Benefits for Disabled Recipient Population | 11,001.15 | 8886.04 |
| Benefits for Young Recipient Population | 1,621.53 | 1231.86 |
| **State Environment Control Variables** | | |
| Medicare Spending Per Recipient | 4,967.27 | 3755.77 |
| Annual Unemployment Rate | 0.0595 | 0.0202 |
| Per Capita Residents Age 65 or Older | 0.1208 | 0.0219 |
| Per Capita Residents Age 14 or Younger | 0.2216 | 0.0222 |
| Per Capita Residents Age 15-44 and Female | 0.2278 | 0.0119 |
| Fraction of State Legislature that is Democrat | 0.5558 | 0.1880 |
| Democrat Controlled State Legislature, 0-1 | 0.4978 | - |
| Divided State Legislature, 0-1 | 0.2466 | - |
| Democrat State Governor, 0-1 | 0.5045 | - |
| Independent State Governor, 0-1 | 0.0127 | - |
| **Instrumental Variables** | | |
| Per Capita Elderly SSI Recipients | 0.0050 | 0.0039 |
| Per Capita Blind-Disabled SSI Recipients | 0.0137 | 0.0072 |
| Per Capita Food Stamp Program Recipients | 0.0793 | 0.0324 |
| Medicaid Recipient Trend | 0.0963 | 0.0438 |

Notes: Sample means and standard deviations reported for data from all U.S states except AZ and HI for FY 1977-2004; OK Medicaid data by recipient group unavailable for fiscal year 1997 and 1998. Expenditures adjusted for inflation using the CPI in 1983-84 dollars.
Sources: National Conference of State Legislatures, U.S. Bureau of Labor Statistics, U.S. Census Bureau, U.S. Department of Agriculture, U.S. Department of Health and Human Services, U.S. Social Security Administration.

**Table 3**

GMM Parameter Estimates of State Demand for Medicaid Benefits Treating the Recipient Population Prices as Endogenous [a]

| | Share of State Medicaid Budget | | | | | |
|---|---|---|---|---|---|---|
| | Old Recipient Population | | Disabled Recipient Population | | Young Recipient Population | |
| Explanatory Variable | Coefficient | SE | Coefficient | SE | Coefficient | SE |
| Ln(Price of Benefits for Old) | 0.089** | 0.040 | 0.019 | 0.039 | -0.115** | 0.029 |
| Ln(Price of Benefits for Disabled) | 0.007 | 0.036 | -0.026 | 0.034 | 0.022 | 0.031 |
| Ln(Price of Benefits for Young) | -0.076** | 0.028 | -0.015 | 0.025 | 0.088** | 0.024 |
| Ln(Per Capita Medicaid Spending) | 0.018 | 0.022 | 0.123** | 0.020 | -0.145** | 0.020 |
| | | | | | | |
| Medicare Spending Per Recipient | -0.0000005 | 0.000002 | 0.0000006 | 0.000002 | -.0000004 | 0.000002 |
| Annual Unemployment Rate | -0.602** | 0.188 | 0.202 | 0.178 | 0.399** | 0.145 |
| Per Capita Residents Age 65 or Older | 0.539 | 0.390 | 1.085** | 0.404 | -1.587** | 0.366 |
| Per Capita Residents Age 14 or Younger | 1.285** | 0.271 | 0.413* | 0.249 | -1.673** | 0.260 |
| Per Capita Residents Age 15-44 and Female | 2.847** | 0.509 | 1.713** | 0.461 | -4.529** | 0.480 |
| Fraction State Legislature that is Democrat | 0.051* | 0.030 | -0.021 | 0.029 | -0.032 | 0.028 |
| Democrat Controlled State Legislature | -0.016** | 0.008 | 0.014** | 0.007 | 0.003 | 0.007 |
| Divided State Legislature | -0.012** | 0.005 | 0.007 | 0.005 | 0.006 | 0.005 |
| Democrat State Governor | -0.004 | 0.005 | -0.005 | 0.004 | 0.010** | 0.004 |
| Independent State Governor | -0.008 | 0.014 | -0.0004 | 0.010 | 0.009 | 0.008 |
| Constant | -0.528** | 0.236 | -1.282** | 0.235 | 2.784** | 0.480 |
| | | | | | | |
| State FEs | Yes | | Yes | | Yes | |
| Time FEs | Yes | | Yes | | Yes | |
| | | | | | | |
| Observations | 1342 | | 1342 | | 1342 | |

Notes: Slope coefficients and robust standard errors reported. Data are from all U.S states except AZ and HI for FY 1977-2004; OK Medicaid data by recipient group unavailable for fiscal year 1997 and 1998.

** Significant at 5-percent level; * Significant at 10-percent level.

[a] Instrumental variables are per capita elderly SSI recipients, per capita blind-disabled SSI recipients, per capita Food Stamp Program recipients, and state-specific Medicaid recipient trend.

**Table 4**
Changes in State Medicaid Spending in Response to Recipient Increases

| | Dollar Change in State Medicaid Spending | | |
|---|---|---|---|
| | Old Recipient Population | Disabled Recipient Population | Young Recipient Population |
| Additional Recipient from Old Population | 4,119** | 875 | -5,334** |
| Additional Recipient from Disabled Population | 246 | -976 | 812 |
| Additional Recipient from Young Population | -623** | -125 | 728** |

Notes: Response calculations for total spending on each population are rounded to nearest dollar and based on price coefficient estimates reported in Table 3. Dollar changes are measured relative to the mean budget shares for each recipient population reported in Table 2.
** indicates the calculated response for total spending on each population is based on a regression coefficient that is significant at the 5-percent level.

**Table 5**

Compensated Price Elasticities and of Demand for Medicaid Benefits by Recipient Population

| | Medicaid Benefits | | |
|---|---|---|---|
| | Old Recipient Population | Disabled Recipient Population | Young Recipient Population |
| Price of Benefits for Old Recipient Population | -0.401** | 0.381** | -0.072 |
| | (0.120) | (0.101) | (0.103) |
| Price of Benefits for Disabled Recipient Population | 0.404** | -0.684** | 0.461** |
| | (0.108) | (0.089) | (0.109) |
| Price of Benefits for Young Recipient Population | 0.056 | 0.244** | -0.405** |
| | (0.083) | (0.064) | (0.086) |

Notes: Robust standard errors reported in parentheses and calculated using the delta method. Elasticities are evaluated using parameter estimates from Table 3 and sample mean budget shares for each population; defined in equation (2). The price of benefits equals per capita recipients net of federal matching aid and benefits equal Medicaid expenditure per recipient for each population.

** Significant at 5-percent level; * Significant at 10-percent level.

**Table 6**

The Substitution Effect Component of State Response to the Price of Medicaid Benefits

| | Dollar Change in State Medicaid Benefit Spending | | |
|---|---|---|---|
| | Old Recipient Population | Disabled Recipient Population | Young Recipient Population |
| Additional Recipient from Old Population | -4,521** | 5,239** | -660 |
| Additional Recipient from Disabled Population | 3,644** | -7,525** | 3,381** |
| Additional Recipient from Young Population | 112 | 593** | -657** |

Notes: Response calculations for total spending on benefits for each population are rounded to nearest dollar and based on compensated price elasticity estimates reported in Table 4. Dollar changes are measured relative to mean benefit levels for each recipient population reported in Table 2.
** indicates the calculated response for spending on benefits for each population is based on an elasticity that is significant at the 5-percent level.

**Table 7**

Evidence of Utility-Maximizing Behavior by States in the Design of Medicaid

| Negativity | $\chi^2$ Test for Symmetry | $\chi^2$ Test for Homogeneity |
|---|---|---|
| $\lambda =$ -0.3844, -0.1237, -0.0028 | 1.8656 (d.f.=3)<br>[0.6008] | 0.3271 (d.f.=3)<br>[0.9549] |

Notes: P-values reported in brackets. Eigenvalues ($\lambda$) for Slutsky matrix reported. The negativity property follows from the concavity of the expenditure function in prices, and implies that for an increase in price, holding utility constant, demand must fall or at least remain unchanged for that good. The Chi-square statistic in the second column tests the null hypothesis that the Slutsky substitution matrix is symmetric; evidence of symmetry in this context suggests states are making consistent choices in response to changes in relative prices. The Chi-square statistic in the second column tests the null hypothesis that the compensated demand functions are homogeneous of degree zero in prices; failure to reject the null suggests the units in which prices are measured have no influence on state choice beyond determining the budget constraint.

** Significant at 5-percent level; * Significant at 10-percent level.

**Table 8**

Specification Tests

| | Medicaid Recipient Population | | |
|---|---|---|---|
| | Old | Disabled | Young |
| F statistics testing the null hypothesis that the instrumental variables are jointly insignificant predictors of Ln(Price of Benefits) | 18.9993**<br>[<0.0001] | 26.7994**<br>[<0.0001] | 37.7929**<br>[<0.0001] |
| $\chi^2$ tests of overidentifying restrictions (d.f.=1) | 0.0009<br>[0.9760] | 1.0555<br>[0.3042] | 1.0243<br>[0.3115] |
| $\chi^2$ tests of endogeneity (d.f.=3) | 9.0769**<br>[0.0283] | 42.1389**<br>[<0.0001] | 16.4414**<br>[0.0009] |

Notes: P-values reported in brackets. ** Significant at 5-percent level; * Significant at 10-percent level.