Do Cost Increases for the Elderly Reduce Benefits for the Disabled? State Government Design of Medicaid with Distinct Recipient Groups

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Abstract

A panel of U.S. state governments over 28 years is used to examine demand for the provision of low-income public health care through the Medicaid program. Allocation of expenditure within the program and between other categories of expenditure is modeled using the demand system developed in Deaton and Muellbauer (1980). We disaggregate the recipient population into distinct demographic groups consisting of the elderly, the disabled, and families, and estimate inter-group substitution patterns. Our main findings indicate that state governments respond unequally to changes in the program costs of each group by reallocating expenditure within Medicaid and between cash assistance welfare.

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Introduction

This research examines how state governments alter inter-group benefits within the Medicaid program . Such an examination is possible because Medicaid consists of three distinct low income recipient groups; the elderly, the disabled, and families.[1] Whether state governments view each of these groups as equivalent, or instead whether one is more favored in the allocation process, motivates our examination. Specifically, if the costs affecting one of the three groups rises, our interest is to determine whether adjustments within a group accommodates the cost increase, whether adjustments affecting other groups within Medicaid are used, or instead whether a group is insulated from cost increases through adjustments outside of the Medicaid budget, including other government low income assistance programs or taxes.

Medicaid is the nations largest public provider of low-income health care insurance; and is unique in the sense that, conditional on income, participants are representative of the full spectrum of ages and disabilities in the country's general population. For this reason, Medicaid provides a unique opportunity to explore the influence of each group on state government behavior, whether that influence is direct (e.g. through lobbying) or indirect (e.g. through taxpayer demand). We accomplish this test by estimating the elasticity of output of each group as a function of the price the government perceives not only for the own group, but for the cross groups as well.

To accomplish the objective of understanding state government response to exogenous changes in the costs of Medicaid, our work carefully distinguishes the price each state faces for each Medicaid policy choice. The definition of price, and therefore of output, is somewhat arbitrary, in that recipients per capita times benefits per recipient equal total expenditure. We arbitrarily and non-substantively select benefits per

[1] Here, the disabled also include the blind and family refers to kids and their adult parents who receive Medicaid coverage as well as first time pregnant women and kids whose parents are not covered.

recipient as the output measure, which leaves recipients per capita as the price.[2] What is important about the selection is that there is an endogenous component to price, although of course it is also subject to many economic forces outside the control of state governments. Key to our analysis is that federally allocated programmatic discretion in Medicaid allows states to respond to budgetary pressure on one dimension of their welfare programs by choosing to emphasize a relatively less expensive alternative(**??**).

The benefit levels chosen by state governments, defined here as group specific expenditure per recipient, reflect two critical characteristics of the health care provided through Medicaid. First, it measures the range of medical services covered. Although the federal government mandates that certain key services be provided (e.g. hospital and physician services), other services such as prescription drugs, rehabilitation therapies, and eye and dental care are made available to recipients only at the state's discretion (**?**). Second, benefit levels reflect the implicit quality of health care chosen by state governments given the considerable control they have over the reimbursement rates paid to health care providers for specific medical services.[3] For these reasons, changes in eligibility or benefits of public health care are likely to introduce unequal budgetary pressure due to the vastly different demand for health care services across recipient groups (**?**).

One reason analysis of governmental response to individual group cost pressures is interesting is to determine the extent to which demands for each group are consistent across states. We believe that such consistency would point to whether recipients are important determinants of public sector behavior, or instead whether general taxpayer concern motivates Medicaid programmatic design. In some senses, this question is the key unanswered question in the analysis of low income assistance. Rent seeking theory

[2]We also show the inverse definition and results below.

[3]For example, **?** find a positive relationship between Medicaid reimbursement rates and risk-adjusted nursing home quality measures and **?** find a negative relationship with respect to the risk of hospitalization. See **?** for a detailed discussion of the quality of care in the American health care system.

suggests that beneficiaries of government programs attempt to influence government behavior. This theory is generally given the least weight as an important component of low income assistance, however, because low income groups are the least politically active, and have the least amount of resources to devote to political participation.

On the other hand, the elderly and disabled are both well defined groups whose membership is not very dynamic. Further, both groups might be expected to be associated with a family that is much broader than the member of that group, giving them political power disproportionate to their size. To the extent that groups of constituents can be effective operating through a political party, each of these two groups might be expected to associate with a single party. It is difficult to ascertain, however, an ideological reason why the elderly or the disabled might be more associated with one political party compared to another. Our panel analysis by states will test whether there is consistency across states, which would be evidence corresponding to national rent seeking behavior. The comparison to low income families in this context is quite interesting, since this group would be expected to be much less effective as a group. That is, low income families are not generally as strongly associated with other families as are the elderly and disabled, so the membership is not as expansive. Further, low income families are a relatively dynamic group, and their differential concern over public policy formation is more likely to be associated only with cash welfare provision. Thus our test of how state governments respond to the three individual groups of recipients offers unique insight into the political process of low income assistance policy formation.

Reallocation of expenditure within the Medicaid program is modeled using the demand system developed in **?**(D-M), where one outcome is the benefit level per recipient for each of the groups, and the price facing states is the number of recipients per capita, distinguished by group, and multiplied by the state matching share.[4] This enables estimation of inter-group substitution patterns between the recipient and benefit dimensions of programmatic design. It is shown that an overlooked mechanism of adjustment in response to budgetary pressure is reallocation of expenditure within the Medicaid program, rather than between Medicaid and other government expenditure, or between Medicaid and total taxes.

Our results quantify the extent to which states react differently depending on the recipient group, and provide an important cautionary tale to major policy changes in public health care provision. We find that state governments respond unequally to changes in the program costs of each group by reallocating expenditure within Medicaid and between cash welfare assistance. Cost increases affecting families are financed by reducing expenditure on the disabled. In contrast, cost increases affecting the elderly and the disabled are financed by reducing expenditure on their own group in addition to reducing expenditure on cash assistance welfare. The unequal response uncovered here suggests a number of policy implications.

Section 2 further elaborates on the motivation for disaggregating Medicaid recipients into demographic groups. The D-M demand system and the utilization of it to model state government expenditure allocation decisions is presented in section 3. Econometric methods are briefly discussed in section 4, while the data is presented in section 5. An important component of the data is the use of an array of federal programmatic controls, as well as political configurations. Section 6 discusses the results, and a final section summarizes, and speculates on how a transition to universal health care might have unintended consequences by impacting the provision of health care for the poverty populations in Medicaid.

[4] Deaton and Muellbauer call their specification the Almost Ideal Demand System (AIDS).

2 Recipient diversity

The objective of our model is to determine how state governments design their Medicaid programs, accounting for the separate demands of the three recipient groups, the elderly, the disabled, and low income families. The disparity in Medicaid is evident in Table 1, where the average real cost of Medicaid benefits to state governments, defined here as group specific expenditure per recipient, is summarized. For example, one elderly recipient costs approximately ten times more than one family recipient on average. Similarly, a disabled recipient costs states about seven times more than a family recipient on average. Our concern is to determine whether changes in the relative costs affect eligibility criteria for each group, for other groups, or are instead smoothed by changes elsewhere in the state government budget.

The relative change in the price of medical care is well known, but is not the only exogenous change affecting state government design of Medicaid. Some of exogenous factors affect the recipient base. Recent research looking into the prevalence of disability in the U.S. has shown that the younger population experienced a rise in disability during the 1980s and 1990s; a period in which disability prevalence and other ailments actually declined for the elderly population (**??**). In addition to the role that individual characteristics and economic conditions play in the growth of disability, in-kind Medicaid benefits also have actuarial value that could be a financial incentive for certain individuals to exit the labor force or appeal to disability status in order to receive health care services (**??**). If states understand that these trends in demographic groups differ and that tradeoffs in expenditure between groups are possible, such as for the cost of covering one elderly recipient they could choose to cover ten family recipients, then aggregate measures of state government price sensitivity can potentially obscure the true underlying response of state governments to budgetary pressure.

Our objective is therefore to construct a model that accounts for exogenous changes in the price and quantity for each recipient group within Medicaid, and to be sensitive to the endogenous components of change. Our model will summarize state government behavior by estimating own and cross price elasticities for the recipients of each group. An important element of our examination, however, will be to also capture how the political process affects the resulting elasticities. We accomplish these objectives by specifying our model with a flexible demand system, the D-M demand system.

3 The D-M demand system model

To accurately estimate inter-group substitution patterns, it is necessary to distinguish between the two main dimensions of programmatic design that are endogenous to state governments, eligibility and benefits, and assume that discretion over eligibility criteria translates into control of the level of recipients. Studies by **?** and **?** emphasize that states do differentiate between the recipient and benefit aspects of program choice in the context of cash-assistance welfare. Extending this distinction to in-kind health care is reasonable given the considerable programmatic discretion also devolved to state governments in this context (**?**). Total per capita state expenditure on Medicaid can be decomposed in the standard fashion as

$$\frac{E_M}{N} = \frac{E_M}{R} \cdot \frac{R}{N} = Benefits \cdot Recipients \tag{1}$$

where E_M is total Medicaid expenditure, R is total Medicaid recipients, and N is the size of a state's population. Both benefits and recipients are variables endogenous to state governments, and differing constituencies within a state interact in conjunction with federal strictures ultimately influence the degree to which each dimension is emphasized (**??**). By explicitly modeling this distinction it is possible to disentangle the responsiveness of state expenditure to budgetary pressure affecting each dimension separately, and empirically verify that states do indeed tradeoff the benefit and recipient aspects of programmatic design as **?** show in the context of cash-assistance welfare. We push our analysis further to show the relative importance of political as opposed to other influences on state governments to ascertain the extent to which low income assistance demand by governments is a function of taxpayers, or recipients, demands.

3.1 Theoretical framework

To apply the D-M demand system in this context, we first abstract from all other commodity groups in which a state has demand and focus exclusively on its expenditure on Medicaid. The institutional framework in which state governments make budgetary decisions suggests that the determination of aggregate expenditure levels precedes the specific allocation of expenditure (**?**), this assumption is relaxed later.[5] We denote a state's expenditure function for Medicaid as

$$E_M = E_M(U, P) \cdot S \tag{2}$$

where S is the share of total Medicaid outlay that states are responsible for financing internally.[6]

Assuming state governments minimize the expenditure E_M required to achieve a particular level of utility (U) when facing a vector of prices for each group of recipients (P) , the demand for Medicaid is derived in the standard manner by applying Shephard's lemma to this expenditure function in log form. The demand for Medicaid takes

[5]At this point, if a general utility function for a state government is thought to exist, preferences are assumed to be weakly separable with Medicaid comprising one out of many commodity groups. Specifically, preferences are separable in that the preference ordering over goods within a commodity group, here Medicaid, is not dependent on consumption levels outside the group. This assumption enables us to model subgroup or within group demands in isolation by focusing on one aspect of the more general maximization problem that a state faces (**?**).

[6]S is equal to $(1 - FMAP)$ where the $FMAP$ is the federal medical assistance percentage that a state receives based on their three year average per capita income relative to national per capita income. It is bounded between 50% for the highest per capita income states and 83% for the lowest per capita income states.

the form

$$\frac{\partial lnE_M}{\partial lnP_i} = \frac{P_i \cdot Q_i}{E_M} = \omega_i \tag{3}$$

where ω_i is the Medicaid expenditure share of recipient group i. At this point, minimal structure has been placed on state government demand for Medicaid. To develop an exact specification of state demand that can be estimated we utilize the D-M cost function in order to express state Medicaid budget shares as a function of group prices and total expenditure such that

$$\omega_i = \alpha_i + \sum_j \gamma_{ij} lnP_j + \beta_i ln\{E_M/P^\star\} \quad \text{for all} \;\; i \tag{4}$$

where $P^\star = \sum \omega_i lnP_i$ is Stone's (1954) price index and is a reasonable linear approximation to the exact price index developed within the D-M demand system (**???**).[7] This set of structural equations allows for the estimation of the impact that each individual group price has on the budget shares for each group. Thus, a group's budget share is treated as being a function of own and cross prices in conjunction with the overall Medicaid budget.

***The parameters in equation (4) are of interest to calculate price and expenditure elasticities of demand. The elasticities can be used to simulate how budgetary pressure and proposed federal policy changes might differentially affect each fo the recipient groups. Uncompensated price elasticities of demand can be expressed as ***The parameters in equation (4) are of interest in themselves, however, so to simulate how budgetary pressure and proposed federal policy changes might differentially affect each of the recipient groups these structural parameters are utilized to calculate price and

[7] The D-M cost function is $lnC(u,P) = \alpha_0 + \sum \alpha_k lnP_k + \frac{1}{2}\sum\sum \gamma^\star_{kj} lnP_k lnP_j + u\beta_0 \prod P_k^{\beta_k}$ whereby further assuming $E_M = C(u,P)$, as would be the case for a utility-maximizing consumer, gives the indirect utility function that is then substituted into the budget share function implied by equation (3) (**?**).

expenditure elasticities of demand. Uncompensated price elasticities of demand can be expressed as

$$
\begin{aligned}
\eta_{ij} &= \frac{\partial ln Q_i}{\partial ln P_j} = -\delta_{ij} + \frac{\partial ln \omega_i}{\partial ln P_j} \\
&= -\delta_{ij} + \frac{\gamma_{ij}}{\omega_i} - \frac{\beta_i}{\omega_i} \cdot \frac{\partial ln P^{\star}}{\partial ln P_j} \\
&= -\delta_{ij} + \frac{\gamma_{ij}}{\omega_i} - \frac{\beta_i}{\omega_i} \cdot \omega_j \qquad (5)
\end{aligned}
$$

where δ_{ij} is the Kronecker delta such that $\delta_{ij} = 1$ for $i = j$ and $\delta_{ij} = 0$ for $i \neq j$. These elasticities measure the tradeoffs states make within each of the component groups and are derived holding total Medicaid expenditure and cross-prices constant (**?**).

The flexibility of the D-M demand system is appealing for three main reasons. First, the literature often models state government demand for both in-kind and cash welfare assistance as that of a representative state resident; typically based on the notion that it is the decisive voter's preferences (**?????**). The functional form of equation (4) allows us to test directly whether state government demand for Medicaid follows from the utility maximization of a rational representative consumer.[8] A priori it is not clear whether state government demand for Medicaid would be consistent with that of a rational consumer. A model of demand in which the features of rational choice can be nested as a hypothesized restricted form is informative; especially considering the prevalence of modeling government demand as that of a representative state resident.[9] If the restricted form of the model is rejected we are left with a demand specification where budget shares are a continuous function of prices and overall budget. With the

[8] 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 (**?**).

[9] **?** develops a general model of the state government maximization problem that does not rely on the extensive assumptions of a decisive voter framework; however, the model does not permit direct testing of the demand function properties implied by rational choice.

inclusion of an intercept term, the estimated unrestricted model yields a local first-order approximation to any demand function (**?**). Thus, the alternative to the hypothesis of a rational representative consumer is a demand function which allows for a general relationship between expenditure, prices, and observed purchases of state governments.

Second, applying the D-M demand system in this context permits the conceptualization of groups of the total recipient population in order to formally test whether state governments exhibit differential preferences for each group. The classification of Medicaid recipients considered here is the elderly ($i = 1$), the disabled ($i = 2$), and families ($i = 3$). Given the importance of various constituencies in the determination of state government behavior, it is unlikely that budgetary pressure on either the eligibility or benefits dimension of Medicaid would stimulate state government policy changes equally for each group. Accordingly, the distinction between recipient groups allows for alternative political environments to exhibit differential effects. Variation in the willingness of state governments to alter aspects of Medicaid particular to each group is also interesting in the context of understanding how states tradeoff group-specific eligibility and benefits in response to budgetary pressures originating from "cross" groups.

Finally, the model can be expanded to incorporate expenditure outside of the Medicaid. A broader model of state government expenditure allocation will allow for an assessment of how inter-group substitution is affected by the budgetary formation process that states utilize. We first formulate the model under the assumption of a two-stage budgeting process for total Medicaid expenditure and then for total welfare program expenditure. Lastly, we formulate the model under the assumption of a single-stage budgeting process that allows for interrelationships between Medicaid allocation decisions, other governmental expenditure, and private expenditure through taxes.

3.2 Empirical framework

To estimate the inter-group substitution patterns between demographic groups of recipients within states, equation (4) is amended to incorporate a vector of time varying exogenous characteristics, **X**, representing environmental, political, and demographic environments that a state would take into account when choosing its Medicaid expenditure on each group. Additionally, state fixed effects are included to control for time-invariant factors that may impact the distribution of Medicaid expenditure across groups as well as time fixed effects to control for macroeconomic factors and federal policy changes affecting all states' Medicaid expenditure over the sample period of 1977-2004. The estimated empirical model in stochastic form is

$$\omega_{ist} = \alpha_{is} + \tau_{it} + \sum_{j} \gamma_{ij} lnP_{jst} + \beta_i ln\{E_{st}/P^{\star}_{st}\} + \mathbf{X}_{st}\Lambda + u_{ist} \quad \text{for all } \; i \tag{6}$$

where ω_{ist} is defined as in equation (3) and u_{ist} are initially assumed to be independently distributed errors and then later tested for exhibiting serial correlation within states.

One crucial advantage of the D-M specification is that it allows for the estimation of state government demand for benefits as well as recipients. In particular, we estimate a specification of equation (6) where benefit levels for each of the groups are the outcomes or purchased quantities Q_{Bi} that states choose; subsequently referred to as benefit demand. When states choose their benefits levels for each group, the price of providing these benefits to a group P_{Bi} is equal to the number of per capita recipients in each group net of federal matching aid. Information on state response for the alternative recipient dimension is obtained by taking the reciprocal of the estimated price elasticity of demand for benefits. The demand for the recipient dimension is directly derived from the estimates of benefit demand. With prices and quantities defined for benefits, the estimated price elasticity of demand as shown in equation (5) takes the form

$$\widehat{\eta}_{Bij} = \frac{\partial lnQ_{Bi}}{\partial lnP_{Bj}} = \frac{\partial ln\ Benefits}{\partial ln\ Recipients} \tag{7}$$

which is then used to directly calculate the price elasticity of demand for recipients as

$$\widehat{\eta}_{Rij} = \frac{\partial lnQ_{Ri}}{\partial lnP_{Rj}} = \frac{\partial ln\ Recipients}{\partial ln\ Benefits} = \frac{1}{\widehat{\eta}_{Bij}} \tag{8}$$

The price elasticities obtained from the estimated parameters in equation (6) fully acknowledge the fact that the price of one choice dimension (benefits) is simultaneously part of the price for the other choice dimension (recipients).

3.3 Identification

In the context of Medicaid, prices for both benefits and recipients are endogenous choices devolved to state governments by the federal government. When estimating benefit demand, for example, it is a concern that states who choose to cover more recipients in a particular group might also choose to offer more (less) benefits to that group or "cross" groups, and OLS estimates would then be biased upward (downward) because the demand system as formulated is not modeling recipient levels as a function of the price of each group (benefit levels). For this reason, equation (6) is a partially specified demand system where prices lnP_{jst} are not independent of the errors u_{ist} if state preference is correlated between groups and across programmatic dimensions. ***The extent to which the preference of a state government changes over time for the sample period considered is not clear; although, it is unlikely to be constant due to constraints originating from a state's changing political environment and the various constituencies evolving within the state that are unobservable to the econometrician.

To remove the simultaneity bias and obtain consistent parameter estimates it is necessary to *only* utilize variability in prices that is orthogonal to a state's time varying idiosyncratic preference for recipient group levels (**?**). Employing a method similar to that of **?**, instrumental variables are constructed which indicate the time-invariant component of a state's preference for recipients in each group subject to an exogenous national level trend in population growth. Specifically, proxy measures for time-invariant preference are taken to equal the state's per capita level of recipients in each group for the year prior to our sample, 1976, and constrained to follow the pattern of growth in the U.S. population for fiscal years 1977-2004.

A key issue in using the rate of growth for the national population instead of state specific population growth is that the model does not allow for differential population growth across states. In the U.S, for example, the states most likely to receive an influx of residents who immigrate from outside the country is not likely to be constant over time. To the extent that foreign immigrants are largely composed of younger individuals this would mainly affect the identification of the parameters in the specification of equation (6) for the family group. Similarly, certain states may experience more migration within the U.S. of one recipient group relative to the others. For these reasons, there is concern about possible serial correlation in the empirical model due to the systematic mismeasurement of the true resident population levels of the elderly, the disabled, and families. A finite sample test for the presence of serial correlation is utilized to assess the robustness of findings and validity of inference ***reference and brief description***.

4 Econometric methods

Equation (6) is estimated using a two-step Generalized Method of Moments procedure for each of the demographic groups in the demand system for Medicaid benefits.[10] The statistical significance of the price elasticities derived from the parameter estimates is evaluated by applying the Delta method to calculate the approximate asymptotic standard errors.[11] An issue in any model including individual fixed effects is one of possible serial correlation in the error terms of individual units due to the systematic mismeasurement or omission of variables affecting the outcomes. A finite sample test for serial correlation developed in **?** is applied here to assess whether inference is valid for the baseline model with no adjustment for serially correlated errors at the state-level.

To test for the presence of serial correlation it is necessary to calculate the appropriate Durbin-Watson statistic (D_P) that is generalized for a panel data setting and then compare to the approximate asymptotic critical value of two. The null of serial independence is rejected if D_P is smaller than two.[12] If the null hypothesis of serial independence is rejected, an adjustment of some kind is in order for valid infer-

[10]Pagan-Hall general*** tests that errors are homoscedastic were rejected at conventional levels of significance; consequently, we use GMM because heteroscedasticity is clearly incorporated into the estimation methodology. In a two-stage least squares framework heteroscedasticity is treated as a nuisance; however, the point estimates are identical to the just-identified GMM results.

[11]Following the methodology outlined in **?**, the appropriate gradient matrix $\mathbf{G}_i$ is constructed such that it contains the relevant partial derivatives of elasticity η_{Bij} with respect to the model parameters and takes the form of

$$\mathbf{G}_i = \begin{bmatrix} \frac{\partial\eta_{i1}}{\partial\gamma_{i1}} & \frac{\partial\eta_{i2}}{\partial\gamma_{i1}} & \frac{\partial\eta_{i3}}{\partial\gamma_{i1}} \\ \frac{\partial\eta_{i1}}{\partial\gamma_{i2}} & \frac{\partial\eta_{i2}}{\partial\gamma_{i2}} & \frac{\partial\eta_{i3}}{\partial\gamma_{i2}} \\ \frac{\partial\eta_{i1}}{\partial\gamma_{i3}} & \frac{\partial\eta_{i2}}{\partial\gamma_{i3}} & \frac{\partial\eta_{i3}}{\partial\gamma_{i3}} \\ \frac{\partial\eta_{i1}}{\partial\beta_{i}} & \frac{\partial\eta_{i2}}{\partial\beta_{i}} & \frac{\partial\eta_{i3}}{\partial\beta_{i}} \end{bmatrix} = \begin{bmatrix} \frac{1}{\omega_i} & 0 & 0 \\ 0 & \frac{1}{\omega_i} & 0 \\ 0 & 0 & \frac{1}{\omega_i} \\ -\frac{\omega_1}{\omega_i} & -\frac{\omega_2}{\omega_i} & -\frac{\omega_3}{\omega_i} \end{bmatrix} \tag{9}$$

The approximate asymptotic standard errors of the price elasticities are then calculated by taking the square root of the diagonal elements of the covariance matrix $\mathbf{V}_i$ defined as

$$\mathbf{V}_i = \mathbf{G}_i' \cdot \widehat{\Omega}_i \cdot \mathbf{G}_i \tag{10}$$

where $\widehat{\Omega}_i$ is the estimated covariance matrix of equation (6). The same method is utilized for the approximate asymptotic standard errors of the recipient demand system elasticities defined in equation (8) by properly*** adjusting the gradient matrix to reflect the effect of the parameters in the model used in its calculation.

[12]The calculation of D_P utilizes the residuals $\widehat{u}_{ist}$ from the estimation of equation (6), for each component group i,

ence.[13]***didn't we do this?

In the context of estimating state government demand for Medicaid by group, it would prove informative to develop a better understanding of how serial correlation affects each of the groups separately. Of particular interest, how the joint insignificance of the instrumental variables used to identify the effect of the endogenous prices is affected.*** **?** further develop a straightforward adjustment procedure which accounts for the fact that states are observed for a limited period of time, thus, resulting in serially correlated error terms.[14] To obtain efficient estimates, the variables in the model are adjusted utilizing the estimated asymptotic serial correlation coefficients***by state/time?.[15]

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and is defined as

$$D_{P_i} = \frac{\sum_{s=1}^{N} \sum_{t=2}^{T} (\widehat{u}_{ist} - \widehat{u}_{ist-1})^2}{\sum_{s=1}^{N} \sum_{t=1}^{T} \widehat{u}_{ist}^2} \quad \text{for each} \quad i$$

[13]In a two-stage least squares framework standard errors can be based on defined groups or clusters within the sample. The parallel method in the GMM framework utilizes a kernel weighting procedure based on an arbitrary number of lagged residuals specified by the econometrician.

[14]If we impose the structure of a first order autoregression on the error terms in equation (6), denoted as

$$u_{ist} = \rho_i \cdot u_{ist-1} + v_{ist}$$

then it is possible to solve for the asymptotic value of ρ_i for each component group. First, a finite sample estimate $\widehat{\rho}_i$ is obtained using the generalized Durbin-Watson statistic where

$$\widehat{\rho}_i = 1 - \frac{D_{P_i}}{2}$$

The asymptotic value of ρ_i is then found by iteratively solving

$$\widehat{\rho}_i = 1 - \frac{(1-\rho_i)(T-1)}{\left[T - \frac{1+\rho_i}{1-\rho_i} + \frac{2\rho_i(1-\rho_i^T)}{T(1-\rho_i)^2}\right]}$$

for ρ_i where T is equal to the number of years that the states are observed.

[15]The initial time observations of the dependent variable are adjusted as

$$\sqrt{1-\rho_i^2}\left[\frac{(T-1)(1-\rho_i)}{T(1-\rho_i)+2\rho_i}\right]\omega_{is1} - \frac{\sqrt{1-\rho_i^2}}{[T(1-\rho_i)+2\rho_i]}\sum_{t=2}^{T}(\omega_{ist} - \rho_i\omega_{ist-1})$$

and subsequent time observations are adjusted as

$$(\omega_{ist} - \rho_i\omega_{ist-1}) - \left[\frac{(1-\rho_i^2)}{T(1-\rho_i)+2\rho_i}\right]\omega_{is1} - \left[\frac{(1-\rho_i)}{T(1-\rho_i)+2\rho_i}\right]\sum_{t=2}^{T}(\omega_{ist} - \rho_i\omega_{ist-1})$$

The initial and subsequent observations of the independent and instrumental variables are also transformed in the same

5 Data

Equation (6) is estimated on a pooled sample of U.S. states for the fiscal years spanning 1977-2004. To capture the exogenous environment in which states operate, so as to restrict our elasticity estimates to reflecting preference variation at the state level to the extent possible, data from a number of government agencies is incorporated into the vector of state-specific characteristics **X** summarized in Table 2. A brief description of the data source and reasoning for inclusion in the model is discussed below.

5.1 Medicaid program

Data on state government Medicaid expenditures and recipients come from the Health Care Financing Administration (HCFA) 2082 forms for 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) and complete data is currently available through fiscal year 2004. Due to missing Medicaid program data and other considerations discussed below, panel data for 47 states are assembled. Arizona is excluded 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 and their universal health care values (**?**). Additionally, Oklahoma is missing a detailed breakdown of expenditure and recipients for 1997-1998 and is therefore not included.[16] Lastly, the federal medical assistance percentages used to calculate the state share of total Medicaid expenditure are obtained from the Green Book for all years and all expendi-

fashion for each component group specification.

[16]Coefficient estimates are not sensitive to the inclusion of OK; however, a balanced panel was opted for given the limited time frame of the data and the focus of the paper on estimating within program changes in expenditure and recipient levels.

ture values are adjusted using the medical care consumer price index (CPI) indexed in 1983-84 dollars to reflect changes in health care costs over time.[17]

5.2 Federal welfare programs

Participation data is employed from two separate federally controlled low income assistance programs to capture two elements important to state government program design. First, because the federal program parameters are identical for all states, participation reflects the income distribution characteristics of a specific group. Second, however, the other element captured by federal program participation is the willingness of the population to participate in government assistance (take-up). The underlying propensity of a given state population to take up welfare is likely to influence the choices state governments make when designing their Medicaid programs. State specific data is collected on Supplemental Security Income (SSI) recipients from the U.S. Social Security Administration on 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. To proxy for the underlying prices of medical care, as well as the propensity of people to use purchased medical inputs, a variable measuring state specific Medicare expenditure per recipient is constructed from data obtained from the U.S. Department of Health and Human Services.

[17]The medical care CPI is designed by the Bureau of Labor Statistics to reflect the average out-of-pocket costs at the retail level to maintain a constant quantity and quality of medical care goods and services over time; reflecting the cost of medical care services and the cost of medical care commodities. Examples of the medical care services taken into account include inpatient and outpatient hospital services, nursing home services, physician services, dental services, and eye care. Examples of medical care commodities accounted for include prescription and nonprescription drugs, medical care supplies, and medical care equipment.

5.3 State environment

A parsimonious set of qualitative variables reflecting the state specific political environment is constructed. Data on the partisan affiliation of state governors and the partisan composition of state legislatures is obtained from the National Conference of State Legislatures for the entire sample period. This information is used 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.

To control for general state demographic characteristics representative of the taxpayer and target populations of Medicaid I 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.[18] Additionally, a proxy for cyclical economic factors include state annual unemployment from the U.S. Bureau of Labor Statistics.

6 Results

The estimates of equation (6), defining the benefit levels for each demographic group of recipients as the choice outcome, are presented in Table 3. The GMM parameter estimates show significant response of benefits to both the own price, and generally to the cross prices; particularly, for the elderly and families.[19] Additionally, the results indicate that state governments view the benefit levels of the elderly and families as necessities. The negative expenditure coefficients imply that when states increased total

[18]Certain people over the age of 65 are eligible for both Medicare and Medicaid; federal law requires Medicaid to pay for any difference in medical care costs not covered by Medicare up to the state specific payment limit.

[19]The estimates from the first stage are presented in Table A-1 of the appendix. The F statistics testing the null that the instruments are jointly insignificant are 33.84, 60.98, and 73.04 in each first stage for the endogenous prices of the elderly, the disabled, and families, respectively, and are above the weak instrument threshold of 10 suggested by **?**.

Medicaid expenditure it was not allocated to the elderly and families; although, for families the effect is not significantly different from zero. In contrast, the disabled are considered luxuries because higher total Medicaid expenditure resulted in an increase in the share of the budget allocated to the disabled.

The importance of these estimates can best be seen in Table 4, which presents the price elasticities of demand for Medicaid benefit levels specified in equation (7) and calculated using equation (5). The elasticities for the recipient dimension specified in equation (8) are simply the reciprocal of those shown in the table; the standard errors are of course different, however, the pattern of significance is unchanged. State governments are found to have inelastic own price responses for benefit levels and elastic own price responses for recipient levels for the elderly and families while demand for disabled benefits is unit-elastic. As a result of the number of elderly, disabled, or family recipients per 100,000 state residents increasing by 10%, expenditure on benefit levels decreases by 4.4%, 10.0%, and 3.5% for each group respectively. Price changes that might stimulate such responses include alteration of income standards, asset accounting procedures, or other criteria used to determine eligibility.[20]

Conversely, an increase in the number or cost of medical services provided to Medicaid recipients results in fairly elastic own price responses for the elderly and families while demand for disabled recipients is unit-elastic. Specifically, if the cost of benefits for the elderly, the disabled, or families increased by 10%, then the number of recipients per 100,000 state residents would decrease by 22.7%, 10.0%, and 28.6% for each group respectively. The price changes that might cause such responses include increases in the cost of health care services, utilization of health care services, or federal policy changes

[20] Over the time frame analyzed here, changes in federal Medicaid legislation disproportionately emphasized mandated coverage of families, primarily pregnant women and children, relative to the elderly or disabled. Additionally, the health care demands of pregnant women and children who are not Medically Needy tend to be fairly standard medical services that would be difficult for a state to eliminate completely from the menu of services it provides. Results not reported here indicate that states do not differentially respond to cost increases affecting mandated recipient relative to discretionary recipients.

affecting reimbursement rates. Thus, in contrast to the benefit dimension, states are much more sensitive to an increase in the cost of benefits for the elderly and families relative to the disabled. Additionally, the adjustment of states in response to budgetary pressure on the disabled component group is not statistically different between benefits and recipients, and unit-elastic demand cannot be rejected at conventional levels of significance for both dimensions.

Perspective on the importance of the asymmetry in state government response can be seen in Table 5, where the statistically significant own and cross price elasticities are utilized to present how exogenous group specific budgetary pressure is financed between demographic groups, holding total Medicaid expenditure constant. One interesting aspect is that program cost changes due to an increase in recipients of a particular group are financed by reducing either the benefits offered or the reimbursement rates for provided services to other demographic groups. If the number of elderly recipients increased, for example, 48% cost increase is financed by reducing the benefits provided to the elderly and the remainder is financed by reducing benefits of the disabled and families by 18% and 33%, respectively. Similarly, if the cost of benefits provided to the elderly increased by a dollar, eligibility is reduced for the elderly, the disabled, and families by 30%, 56%, and 14%, respectively. A possible explanation for this pattern of substitution is that states have leeway in disqualifying disabled Medicaid recipients via stricter definitions of disability as opposed to reducing their benefit levels. Nonetheless, the main point that states do not respond equally to increases in cost of the demographic groups cannot be avoided.

6.1 Rational choice

The fundamental axioms of rational choice imply two testable hypotheses of observable demand behavior. Utilizing the parameter estimates in Table 3, the Slutsky substitution matrix is calculated in order to test whether it is negative semidefinite and symmetric.[21] The eigenvalues of the Slutsky matrix calculated using the sample mean budget shares are shown in Table 6. Two have the correct negative sign, however, one is positive and fairly close to zero. While not a formal statistical test, the Slutsky matrix does appear to be near negative semidefinite. Further, chi-squared statistics testing the null of symmetry and homogeneity are shown in Table 6. We reject the null hypothesis of symmetry and homogeneity at conventional levels of significance.

6.2 Robustness of findings to serial correlation

We further assess the robustness of the results to serial correlation by applying the adjustment detailed in equations (11)and (11) using the asymptotic ρ_i equal to 0.80, 0.86, and 0.76 for the elderly, the disabled, and family component groups respectively.[22] The group least affected by serial correlation is families, however, so to see the implications of the pattern of serial correlation across groups the F statistics testing the null hypothesis that the instruments are jointly insignificant in the first stage for the unadjusted and adjusted models are presented in Table 7. The statistical significance of the instruments is affected considerably once serial correlation is accounted for. The larger the effect of lagged values, indicated by higher ρ_i, the less significant the instruments are. Accordingly, the families are the group with the strongest adjusted first stage relative to the elderly and the disabled. An important insight from this analysis is that the identification of static fixed effects models with endogenous variables can seem to be quite strong if the possibility of serial correlation is ignored.

The adjusted price elasticities of demand for benefit and recipient levels are shown

[21]The Slutsky equation in elasticity form, $\eta^{\star}_{ij} = \eta_{ij} + \omega_j \cdot \eta_{iE}$, allows for the determination of unobservable compensated price elasticities of demand after first calculating uncompensated price elasticities as in equation (5) and expenditure elasticities as $\eta_{iE} = 1 + \frac{\beta_i}{\omega_i}$. The compensated price elasticities for each group are then normalized such that elements in the Slutsky matrix are equal to $\omega_i \cdot \eta^{\star}_{ij}$ (?).

[22]The generalized Durbin-Watson statistics for each group are presented in Table A-2 of the appendix. The null of serial independence is decisively rejected for each group.

in Table 8. There is little difference in magnitude between the unadjusted and adjusted estimates, however, the pattern of significance is changed. The component group of families does not have a statistically significant own price effect in the adjusted model and their is no longer a statistically significant cross-price effect of the elderly on the disabled and families. Once the presence of serial correlation is acknowledged, substitution between demographic groups is reduced, but not eliminated completely. Table 9 shows how exogenous group specific budgetary pressure is financed between demographic groups after accounting for autocorrelation, holding total Medicaid expenditure constant. Cost increases affecting the elderly are financed without reducing expenditure on other groups while this is not true for the disabled and families. Lastly, Table 10 displays the evidence of state government utility maximization after adjusting for serial correlation in the model. All eigenvalues of the Slutsky substitution matrix are negative, however, we reject the null hypothesis of symmetry and homogeneity at conventional levels of significance.

6.3 Robustness of findings to aggregate welfare expenditure

To further assess the robustness of inter-group substitution patterns uncovered, the state government budget is expanded to include all welfare expenditure. A fourth category ($i = 4$) representing cash assistance welfare is modeled with the price states face equal to the Aid to Families with Dependent Children (AFDC) matching rate through fiscal year 1996. Thereafter, the price states face is equal to one to reflect the change in federal financing policy from a matching grant to a block grant under the Temporary Assistance for Needy Families (TANF) program.

Table 11 presents results for the expanded model incorporating cash assistance welfare and adjusting for state-specific serial correlation.[23] In comparison to Table 8, in

[23]The generalized Durbin-Watson statistics are 0.54, 0.50, 0.71, and 0.50 for the elderly, the disabled, families, and

which state Medicaid expenditure is assumed to be independent of cash-assistance welfare, an increase in the number of elderly or disabled recipients results in an aggregate decrease in expenditure on cash assistance welfare by states. Further, allowing states to finance Medicaid program costs from their entire welfare budget results zero substitution of elderly benefits for disabled recipients. Lastly, Table 12 displays the evidence of state government utility maximization after adjusting for serial correlation in the expanded model. All eigenvalues of the Slutsky substitution matrix are negative, we reject the null hypothesis of symmetry, and fail to reject the null hypothesis of homogeneity at conventional levels of significance. This suggests the expanded model of state government expenditure including in-kind and cash welfare adheres closer to the properties predicted by the fundamental axioms of rational choice. Overall, inter-group substitution patterns remain evident.

6.4 Robustness of findings to aggregate state expenditure

To even further assess the robustness of inter-group substitution patterns uncovered, the state government budget is expanded to include all income in the state. A fifth ($i = 5$) category representing government expenditure net of expenditure on cash assistance and Medicaid is modeled with the price states face equal to one minus the ratio of federal grants to states divided by net government expenditure. Additionally, a sixth ($i = 6$) category representing private resident expenditure is modeled with the price states face equal to one minus the ratio of federal income taxes paid divided by total personal income. Table 13 presents the price elasticities of demand, and we see that the pattern of inter-group substitution in response to Medicaid program costs changing persist. In contrast to the previous model focusing exclusively on states'

cash assistance, respectively. The asymptotic serial correlation coefficients are 0.83, 0.86, 0.73, and 0.86 for the same budget categories.

welfare budgets, there is no longer substitution between the elderly and disabled with cash assistance. Further, some evidence is uncovered indicating that state governments do take into account the provision of other goods and services when choosing how to allocate expenditure to Medicaid. If the ratio of federal grants to state expenditure decreases then states respond by reducing benefit levels of the elderly and families. Lastly, Table 14 indicates evidence of state government utility maximization is weaker for this model relative to models more limited in scope.

7 Discussion

The detailed model for Medicaid presented here is the first time that the underlying state government demand functions for Medicaid have been explored using disaggregated measures of program characteristics. The key contribution of this exploration is a first step toward understanding the relative importance of three distinct constituencies that comprise recipients of governmental health care assistance through Medicaid. Using pooled data across nearly thirty years for U.S. states, price elasticities of demand are estimated by constituency group and inter-group substitution patterns are uncovered. We find that state governments respond unequally to changes in the program costs of each group by reallocating expenditure within Medicaid and between cash welfare assistance. Cost increases affecting families are financed solely by reducing expenditure on the disabled. In contrast, cost increases affecting the elderly and the disabled are financed by reducing expenditure on their own group in addition to reducing expenditure on cash assistance welfare.

An essential element of this presentation is the incorporation of the institutional structure of Medicaid that allows states discretion over both eligibility and benefit levels. The tradeoffs revealed here between these two distinct choice aspects of programmatic design are important for understanding how proposed policy changes at the federal level might impact the spectrum of provision of low income health care assistance. In this tradeoff, a considerable distinction is found for state response to budgetary pressure for the elderly, the disabled, and families. State governments exhibit a more elastic price response when facing budgetary pressure due to an underlying rise in the cost of benefits relative to recipients for the elderly and family component groups. This suggests that increasing the number of recipients, as would be the case if universal health care is adopted, would not stimulate as large a response from state governments relative to costs increases of health care services. One potential explanation for the lower measured response of states to recipient increases is that states may not be able to change the cost or scope of health care services as easily as eligibility guidelines such as income standards, asset accounting procedures, or the specific criteria used to determine disability status.

The substitution patterns uncovered here indicate that families seem to be a unique constituency among state residents in that financial resources are not diverted from their group in order to help finance program cost increases. Moreover, a clear distinction also emerges regarding how state governments finance increases in program costs by reducing the eligibility and benefit levels for the disabled. The substitution of the disabled for families implies that the disabled would be the group most influenced by major changes in the scope of public health care programs. In the context of proposals by individual states to adopt universal health care, the inter-group substitution patterns found here are quite important. In particular, if the cross price elasticities for the poverty populations are applied more generally, large expansions in the family population of recipients are likely to result in significant reductions in the health care of the disabled.

Maybe the most important element of this research, however, is that an overlooked mechanism of adjustment in response to budgetary pressure occurs within the Medicaid program, rather than between Medicaid and other government expenditure, or between Medicaid and total taxes. The general point that states work to finance the costs of eligibility or benefit changes in part through alterations of existing health care provisions cannot be avoided. Uncovering these interrelationships between recipient groups and the particular pattern illustrates an advantage of carefully analyzing the internal workings of this most complicated of the current US low income assistance programs in order to help better inform policy discussion. An aggregate analysis of Medicaid would fail to disentangle the true underlying response of state governments within the program and underestimate the degree to which states do in fact respond. Furthermore, any meaningful policy discussion would be concerned with how changing the scope of public health care provision might differentially impact the preexisting poverty populations already utilizing Medicaid.

Table 1: Sample means of demand system variables for Medicaid benefits[1,2]

Group:	Elderly ($i = 1$)	Disabled ($i = 2$)	Families ($i = 3$)
Budget share (ω_i)	0.38	0.36	0.26
	(0.11)	(0.07)	(0.08)
Benefits per recipient (Q_{Bi})	23,431	15,702	2,312
	(21825)	(14586)	(2043)
Recipients per 100,000 (P_{Bi})	520	650	2,948
	(212)	(353)	(1400)

Note: Data from all U.S states except AZ, HI, and OK for fiscal years 1977-2004.

Sources: Medicaid data from HCFA 2082 forms through FY1998 and MSIS system thereafter; and population data from the U.S. Census Bureau.

[1]Standard deviations in parentheses.

[2]Expenditures adjusted for inflation using medical care CPI in 1983-84 dollars.

References

Table 2: Sample means of selected state characteristics for 1977-2004

Control Variable	Mean	SD
Divided state legislature, 0-1	0.25	-
Democrat controlled state legislature, 0-1	0.49	-
Democrat state governor, 0-1	0.50	-
Independent state governor, 0-1	0.01	-
Medicare expenditure per recipient	3,319	1884
Annual state unemployment rate	0.060	0.020
Per capita elderly SSI recipients	0.005	0.004
Per capita blind-disabled SSI recipients	0.014	0.007
Per capita Food Stamp Program recipients	0.079	0.033
Percent of pop. age 65 or older	0.121	0.020
Percent of pop. age 14 or younger	0.222	0.022
Percent of pop. age 15-44 and female	0.228	0.012

Note: Data from all U.S states except AZ, HI, and OK for fiscal years 1977-2004.
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, and U.S. Social Security Administration.

Table 3: GMM parameter estimates of state demand for Medicaid benefits[1,2,3]

	Share of Medicaid Budget		
	Elderly	Disabled	Families
Dependent Variable:	(ω_1)	(ω_2)	(ω_3)
Price of Elderly ($\widehat{\gamma}_{i1}$)	0.185**	−0.034	−0.151**
	(0.044)	(0.025)	(0.037)
Price of Disabled ($\widehat{\gamma}_{i,2}$)	−0.112**	0.034	0.078**
	(0.027)	(0.025)	(0.025)
Price of Families ($\widehat{\gamma}_{i3}$)	−0.044**	−0.122**	0.167**
	(0.021)	(0.015)	(0.020)
Medicaid Expenditure ($\widehat{\beta}_i$)	−0.071**	0.094**	−0.022
	(0.029)	(0.019)	(0.026)
Number of observations	1316	1316	1316

Note: Heteroscedasticity consistent standard errors in parentheses.

[1] All regressions include state and time fixed effects; control variables included are state annual unemployment, Medicare expenditure per recipient, per capita SSI elderly recipients, per capita SSI blind-disabled recipients, per capita Food Stamp recipients, percent of population age 65 or older, percent of population age 14 or younger, percent of population age 15-54 and female, divided state legislature, Democratically controlled state legislature, Democratic state governor, and Independent state governor.

[2] Group specific price equals the natural log of group recipients per 100,000 state residents net of federal matching aid.

[3] Instruments for price variables in fiscal years 1977-2004 are fiscal year 1976 recipients per 100,000 state residents in each group constrained to follow the trend in U.S. population growth.

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

Table 4: Group price elasticities of demand for Medicaid benefits[1,2]

Group:	Elderly ($i=1$)	Disabled ($i=2$)	Families ($i=3$)
Elderly ($\widehat{\eta}_{Bi1}$)	-0.44^{**}	-0.20^{**}	-0.54^{**}
	(0.14)	(0.10)	(0.17)
Disabled ($\widehat{\eta}_{Bi2}$)	-0.23^{**}	-1.00^{**}	0.32^{**}
	(0.08)	(0.07)	(0.10)
Families ($\widehat{\eta}_{Bi3}$)	-0.07	-0.41^{**}	-0.35^{**}
	(0.07)	(0.05)	(0.09)

Note: Data from all U.S states except AZ, HI, and OK for fiscal years 1977-2004.

[1]Price elasticities defined as $\widehat{\eta}_{Bij} = \frac{\%\Delta Q_i}{\%\Delta P_j}$, where Q = average group benefits per recipient and P = group recipients per 100,000 state residents net of federal matching aid.

[2] Evaluated using parameter estimates from Table **??** and sample mean budget shares; standard errors calculated using the delta method.

[3]Price elasticity for recipient dimension $\widehat{\eta}_{Rij}$ is the reciprocal of $\widehat{\eta}_{Bij}$; noted in equation (8).

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

Table 5: Predicted state government response to Medicaid program cost increases[1]

		Benefits[2]	Recipients[3]
Elderly	Own	-48%	-30%
	Disabled	-18%	-56%
	Families	-33%	-14%
Disabled	Own	-94%	-24%
	Elderly	-26%	-126%
	Families	20%	51%
Families	Own	-36%	-44%
	Elderly	0%	0%
	Disabled	-64%	-56%

Note: Estimated elasticities that are statistically insignificant in Table **??** are zero here.

[1]Adjustment to group specific price shock sums to 100% since total Medicaid expenditure is held constant.

[2]Cost increase is 1 unit increase in group recipients per capita.

[3]Cost increase is $1 increase in group benefits per group recipient.

Table 6: Evidence of state government utility maximization

Negative Semidefinite[1]:	$\lambda = (5.9 \times 10^{-08}, \ -0.14 \pm 0.06i)$
χ^2 test for Symmetry[2]:	56.69^{**} [< 0.0001]
χ^2 test for Homogeneity[2]:	15.85^{**} [0.0012]

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

[1] Eigenvalues(λ) for Slutsky matrix shown.

[2] df=3

Table 7: Significance of instruments in first stage of the unadjusted and adjusted models[1]

Endogenous Price:	Elderly (lnP_1)	Disabled (lnP_2)	Families (lnP_3)
Unadjusted[2]			
F statistic	33.84**	60.98**	73.04**
	[<0.0001]	[<0.0001]	[<0.0001]
Adjusted[3]			
F statistic for ω_1	12.55**	11.21**	27.68**
	[<0.0001]	[<0.0001]	[<0.0001]
F statistic for ω_2	9.61**	9.10**	20.05**
	[<0.0001]	[<0.0001]	[<0.0001]
F statistic for ω_3	14.21**	12.71**	32.47**
	[<0.0001]	[<0.0001]	[<0.0001]
Number of observations	1316	1316	1316

Note: Heteroscedasticity consistent P-values in brackets for unadjusted model; heteroscedasticity and autocorrelation consistent P-values in brackets for adjusted model.

[1] F statistics test the null that the instruments are jointly insignificant; df= 3, 1226.

[2] First stages are identical for each component group budget share (ω_i) regression

[3] Adjusted model applies the serial correlation adjustment outlined in section 4.

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

Table 8: Adjusted group price elasticities of demand for Medicaid benefits[1,2,3,4]

Group:	Elderly ($i=1$)	Disabled ($i=2$)	Families ($i=3$)
Elderly ($\widehat{\eta}_{Bi1}$)	-0.77^{**}	-0.19	-0.09
	(0.19)	(0.16)	(0.24)
Disabled ($\widehat{\eta}_{Bi2}$)	-0.29^{*}	-1.11^{**}	0.47^{**}
	(0.17)	(0.20)	(0.22)
Families ($\widehat{\eta}_{Bi3}$)	-0.17	-0.51^{**}	-0.14
	(0.11)	(0.12)	(0.16)

Note: Data from all U.S states except AZ, HI, and OK for fiscal years 1977-2004.

[1]Medicaid price elasticities defined as $\widehat{\eta}_{Bij} = \frac{\%\Delta Q_i}{\%\Delta P_j}$, where Q = average group benefits per recipient and P = group recipients per 100,000 state residents net of federal matching aid.

[2] Evaluated using parameter estimates from Table **??** and sample mean budget shares; standard errors calculated using the delta method.

[3]Price elasticity for recipient dimension $\widehat{\eta}_{Rij}$ is the reciprocal of $\widehat{\eta}_{Bij}$; noted in equation (8).

[4]These estimates are similar to Table 4 but adjust for panel serial correlation; see Section **??**.

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

Table 9: Adjusted predicted state government response to Medicaid program cost increases[1]

		Benefits[2]	Recipients[3]
Elderly	Own	-100%	-100%
	Disabled	0%	0%
	Families	0%	0%
Disabled	Own	-97%	-25%
	Elderly	-30%	-114%
	Families	27%	40%
Families	Own	0%	0%
	Elderly	0%	0%
	Disabled	-100%	-100%

Note: Estimated elasticities that are statistically insignificant in Table ?? are zero here.

[1]Adjustment to group specific price shock sums to 100% since total Medicaid expenditure is held constant.

[2]Cost increase is 1 unit increase in group recipients per capita.

[3]Cost increase is $1 increase in group benefits per group recipient.

Table 10: Adjusted evidence of state government utility maximization

Negative Semidefinite[1]:	$\lambda = (-0.01, \ -0.18 \pm 0.04i)$
χ^2 test for Symmetry[2]:	17.48^{**} [0.0006]
χ^2 test for Homogeneity[2]:	12.01^{**} [0.0073]

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

[1] Eigenvalues(λ) for Slutsky matrix shown.

[2] df=3

Table 11: Adjusted price elasticities of demand for cash welfare assistance and group-specific Medicaid benefits[1,2,3,4]

Group:	Elderly ($i=1$)	Disabled ($i=2$)	Families ($i=3$)	Cash assistance[5] ($i=4$)
Elderly ($\widehat{\eta}_{Bi1}$)	-0.70^{**}	0.19	0.07	-0.68^{**}
	(0.14)	(0.14)	(0.16)	(0.23)
Disabled ($\widehat{\eta}_{Bi2}$)	0.10	-0.76^{**}	0.44^{**}	-0.88^{**}
	(0.22)	(0.18)	(0.19)	(0.38)
Families ($\widehat{\eta}_{Bi3}$)	-0.19	-0.43^{**}	-0.21	0.02
	(0.16)	(0.20)	(0.20)	(0.30)
Cash assistance ($\widehat{\eta}_{Bi4}$)	0.03	-0.07	-0.09	-0.88^{**}
	(0.06)	(0.08)	(0.08)	(0.14)

Note: Data from all U.S states except AZ, HI, and OK for fiscal years 1977-2004.

[1]Medicaid price elasticities defined as $\widehat{\eta}_{Bij} = \frac{\%\Delta Q_i}{\%\Delta P_j}$, where Q = average group benefits and P = group recipients per 100,000 state residents net of federal matching aid.

[2] Evaluated using parameter estimates from Table **??** and sample mean budget shares; standard errors calculated using the delta method.

[3]Price elasticity for recipient dimension $\widehat{\eta}_{Rij}$ is the reciprocal of $\widehat{\eta}_{Bij}$; noted in equation (8).

[4]These estimates are adjusted for panel serial correlation; see Section **??**.

[5]Q = total state expenditure on cash assistance welfare per 100,000 state residents and P = a state's own share of AFDC expenditure through FY1996 and 100% thereafter reflecting the change to federal block grant financing with TANF.

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

Table 12: Adjusted evidence of state government utility maximization for expenditure on cash welfare assistance and group-specific Medicaid benefits

Negative Semidefinite[1]:	$\lambda = (-0.25, \ -0.005, \ -0.08 \pm 0.11i)$
χ^2 test for Symmetry[2]:	18.77^{**} [0.0046]
χ^2 test for Homogeneity[3]:	7.70 [0.1032]

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

[1] Eigenvalues(λ) for Slutsky matrix shown.

[2] df=6

[3] df=4

Table 13: Adjusted price elasticities of demand for cash welfare assistance, group-specific Medicaid benefits, all other state government expenditure, and private state resident expenditure[1,2,3,4]

Group:	Elderly ($i=1$)	Disabled ($i=2$)	Families ($i=3$)	Cash assistance[5] ($i=4$)	Government expenditure[6] ($i=5$)	Private expenditure[7] ($i=6$)
Elderly ($\widehat{\eta}_{Bi1}$)	-1.13^{**}	-0.17	-0.12	-0.53	0.07	-0.006
	(0.45)	(0.45)	(0.40)	(0.49)	(0.08)	(0.009)
Disabled ($\widehat{\eta}_{Bi2}$)	0.17	-1.60^{**}	0.10	-0.41	-0.16	0.019
	(0.56)	(0.66)	(0.49)	(0.72)	(0.11)	(0.013)
Families ($\widehat{\eta}_{Bi3}$)	-0.58	-0.83^{**}	-0.59^{*}	2.13^{**}	-0.08	0.008
	(0.41)	(0.39)	(0.33)	(0.34)	(0.06)	(0.007)
Cash assistance ($\widehat{\eta}_{Bi4}$)	0.60^{**}	0.66^{**}	0.28	-1.47^{**}	0.07	-0.011
	(0.29)	(0.29)	(0.22)	(0.36)	(0.05)	(0.006)
Government expenditure ($\widehat{\eta}_{Bi5}$)	-0.72^{**}	-0.38	-0.96^{**}	0.35	0.68^{**}	-0.186^{**}
	(0.36)	(0.40)	(0.32)	(0.56)	(0.21)	(0.024)
Private expenditure ($\widehat{\eta}_{Bi6}$)	0.93	0.87	1.80^{*}	0.98	-0.56	-0.943^{**}
	(1.39)	(0.1.42)	(0.96)	(2.21)	(0.56)	(0.064)

Note: Data from all U.S states except AZ, HI, and OK for fiscal years 1977-2004.

[1]Medicaid price elasticities defined as $\widehat{\eta}_{Bij} = \frac{\%\Delta Q_i}{\%\Delta P_j}$, where Q = average group benefits per recipient and P = group recipients per 100,000 state residents net of federal matching aid.

[2] Evaluated using parameter estimates from Table **??** and sample mean budget shares; standard errors calculated using the delta method.

[3]Price elasticity for recipient dimension $\widehat{\eta}_{Rij}$ is the reciprocal of $\widehat{\eta}_{Bij}$; noted in equation (8).

[4]These estimates are adjusted for panel serial correlation; see Section **??**.

[5]Q = total state expenditure on cash assistance welfare per 100,000 state residents and P = a state's own share of AFDC expenditure through FY1996 and 100% thereafter reflecting the change to federal block grant financing with TANF.

[6]Q = total state government expenditure per 100,000 state residents net of Medicaid and cash assistance welfare and P = one minus the ratio of federal grants to other expenditure; does not include federal grants to states for air transportation, health and hospitals, public welfare, and all utilities (water supply, electric power, gas supply, and transit system).

[7]Q = total state income 100,000 state residents net of total state expenditure and P = 1.

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

Table 14: Adjusted evidence of state government utility maximization for expenditure on cash welfare assistance, group-specific Medicaid benefits, all other state government expenditure, and private state resident expenditure

Negative Semidefinite[1]:	$\lambda = (0.04,\ 0.0001,\ -0.02,\ -0.003,\ -0.002 \pm 0.002i)$
χ^2 test for Symmetry[2]:	50.72^{**} [< 0.0001]
χ^2 test for Homogeneity[3]:	11.09^{*} [0.0856]

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

[1] Eigenvalues(λ) for Slutsky matrix shown.

[2] df=15

[3] df=6

Appendix

Table A-1: First stage estimates of state demand for Medicaid benefits[1,2,3]

Endogenous Price:	Elderly (lnP_1)	Disabled (lnP_2)	Families (lnP_3)
Elderly price trend	-0.0027^{**}	-0.0011^{**}	-0.0002
	(0.0003)	(0.0003)	(0.0003)
Disabled price trend	0.0012^{**}	-0.0034^{**}	0.0030^{**}
	(0.0005)	(0.0004)	(0.0005)
Families price trend	0.0003^{**}	0.0004^{**}	-0.0011^{**}
	(0.0001)	(0.0001)	(0.0001)
F statistic[4]	33.84^{**}	60.98^{**}	73.04^{**}
	[<0.0001]	[<0.0001]	[<0.0001]
Number of observations	1316	1316	1316

Note: Heteroscedasticity consistent standard errors in parentheses and p-values in brackets.

[1] All regressions include state and time fixed effects; control variables included are state annual unemployment, Medicare expenditure per recipient, per capita SSI elderly recipients, per capita SSI blind-disabled recipients, per capita Food Stamp recipients, percent of population age 65 or older, percent of population age 14 or younger, percent of population age 15-54 and female, divided state legislature, Democratically controlled state legislature, Democratic state governor, and Independent state governor.

[2] Group specific price equals the natural log of group recipients per 100,000 state residents net of federal matching aid.

[3] Instruments for price variables in fiscal years 1977-2004 are fiscal year 1976 recipients per 100,000 state residents in each group constrained to follow the trend in U.S. population growth.

[4] Test that the instruments are jointly insignificant; df= 3, 811.

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

Table A-2: Test for serial correlation in the unadjusted and adjusted models

	Share of Medicaid Budget		
	Elderly	Disabled	Families
Dependent Variable:	(ω_1)	(ω_2)	(ω_3)
Unadjusted Model[1]			
D_{P_i}	0.60	0.50	0.66
Asymptotic ρ_i	0.80	0.86	0.76
Adjusted Model[2]			
D_{P_i}	2.25	2.18	2.26

Note: Generalized Durbin-Watson statistics are shown; the null of serial independence rejected if $D_{P_i} < 2$.

[1]Calculation of D_{P_i} is based on residuals from regressions in Table **??**.

[2]Adjusted model applies the serial correlation adjustment outlined in section 4.