Berendt, Emil Bohdan

THE DEMAND FOR MEDICAID AND AFDC

City University of New York PH.D. 1985

University
Microfilms
International 300 N. Zeeb Road, Ann Arbor, MI 48106

THE DEMAND FOR MEDICAID AND AFDC

by

EMIL BOHDAN BERENDT

A dissertation submitted to the Graduate Faculty
in Economics in partial fulfillment of the
requirements for the degree of Doctor of Philosophy,
The City University of New York.

1985

This manuscript has been read and accepted for the Graduate Faculty in Economics in satisfaction of the dissertation requirement for the degree of Doctor of Philosophy.

4/24/85 — Michael Grossman

date — Chairman of Examining Committee

4/24/85 — Michael Grossman

date — Executive Officer

Professor Michael Grossman

Professor Herbert Geyer

Professor Salih Neftci

Supervisory Committee

The City University of New York

Abstract

THE DEMAND FOR MEDICAID AND AFDC

by

EMIL BOHDAN BERENDT

Advisor: Professor Michael Grossman

This dissertation estimates joint demand functions for the Medicaid and Aid to Families With Dependent Children (AFDC) programs. In recent years there has been much effort expended in analyzing the demand for public redistribution. Most studies, however, have ignored the interrelationships between the various redistributive programs. The purpose of this dissertation is to develop and test a model in which the cost to voters of each of the two programs affects the demand for both programs. Using the political process, the voter simultaneously makes known his demand for Medicaid and AFDC recipients and for the AFDC benefit level.

This study concludes that the demand for Medicaid recipients depends on the costs of the AFDC program and that the demands for AFDC benefits and recipients are functions of some of the costs of the Medicaid program. The results of the Medicaid regressions show that the AFDC benefit level and

average state matching share, which are components of the shadow price of the AFDC recipient rate, generally have significantly positive effects. Two of the variables making up the shadow price of AFDC benefits, the AFDC recipient rate and the marginal state matching share, usually have negative signs.

The Medicaid benefits and state matching share have negative effects on the AFDC recipient rate demanded. This indicates the shadow price of the Medicaid recipient rate has an effect on the demand for the AFDC recipient rate. In the demand for AFDC benefits, the Medicaid and AFDC shadow price variables have signs that are sensitive to the econometric treatment of the regressions.

There has been much criticism of the present federal matching rate formulas used in the two programs. The results of this dissertation point out that in any discussion of reform, the cross-program effects of a change in matching rates should be taken into account.

Ackowledgements

I wish to thank Professor Michael Grossman for his patience and helpful comments while I was writing this dissertation. Whenever I ran into difficulties, he was always there to extend a helping hand. I would also like to express my appreciation to Professors Herbert Geyer and Salih Neftci for taking time out of their busy schedules to read and comment on my work.

Finally, my thanks go to my sister and parents, without whose moral support I would never have been able to complete this dissertation.

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER I

INTRODUCTION

A. Purpose

This dissertation estimates joint demand functions for the Medicaid and AFDC (Aid to Families With Dependent Children) programs. In recent years there has been a growing literature analyzing the demand for public redistribution programs. Most studies, however, have ignored the interrelationships between the various programs. The purpose of this dissertation is to develop and test a model in which the cost to voters of each of the two programs affects the demand for both programs.

Income transfer programs have been fruitfully studied by assuming donors receive utility from recipients' incomes or general consumption levels. Subsidies or transfers of specific goods have also been examined using models where the recipients' consumption of the good enters the donors' utility functions. The coexistance of both categories of programs indicates donors receive satisfaction from recipients' consumption levels in general and from the consumption of selected goods. This implies the donors' demand for income transfers and subsidies are interrelated. Understanding these interrelationships is necessary when changing basic policy variables such as the degree of federal financial support for these programs.

B. The Medicaid and AFDC Programs

The two programs examined here, Medicaid and AFDC, are the largest of their type in the United States. The AFDC program, the older of the two, was established by Title IV of the Security Act of 1935 under the name of the Aid to Dependent Children (ADC) program. The Act also created the Old Age Assistance (OAA) and Aid to the Blind (AB) programs. OAA, AB, and Aid to the Permanently and Totally Disabled (APTD) were later replaced by the Supplemental Security Income (SSI) program. ADC gave aid to children without support because of the death, absence or incapacitation of a parent. Because of desertions by fathers to meet the eligibility requirements, Title IV was amended in 1961 to allow states to give aid to children of unemployed parents. In accordance with this change, the program was renamed Aid to Families with Dependent Children.

Both the state and federal governments contribute financially to the program. The relative shares of the contributions are determined by a formula specified in the Social Security Act. In most states, AFDC covers children without a father at home. Some states extend aid to families where the father is unemployed and not receiving unemployment compensation. A few states make AFDC available to all children in families with incomes below a certain level. The eligibility level of income as well as the benefit level are determined by the individual states.

Medicaid (Title XIX of the Social Security Act) is a vendor payment program which provides medical assistance to the poor. It replaced the Kerr-Mills Act in 1965. Like AFDC, it is a joint federal-state program. All recipients of AFDC and most SSI recipients are eligible for Medicaid. In addition, if a state so chooses, other people deemed "medically needy" and not receiving assistance under AFDC or SSI may receive Medicaid. The medically needy are defined as those who fit into one of the categories of people covered by AFDC or SSI (i.e., the aged, blind, disabled or those belonging to a family where one parent is absent, incapacitated or unemployed) and have enough income to pay for basic living expenses but not enough to pay for medical care. States may also include persons not falling into one of these categories but the states must forego federal matching aid for those individuals.

States' Medicaid programs must cover certain services such as inpatient and outpatient hospital, laboratory and X-ray, nursing, physician, family planning, and rural health clinic services. There are services the states may chose not to cover. Examples are drugs, eyeglasses, physical therapy, and dental care. The reimbursement rate, which is determined by the state, must be accepted by providers of medical care as payment in full. Since states have some control in setting eligibility levels for welfare and decide whether to extend Medicaid to those outside the AFDC and SSI programs, the states determine the total number of Medicaid recipients. States also have some freedom in determining the reimbursement rate and the types of medical services covered.

CHAPTER II

PREVIOUS STUDIES OF WELFARE EXPENDITURES

A. Studies of the Determinants of Welfare Expenditures

One of the earliest empirical studies analyzing public welfare expenditures was done by Solomon Fabricant. He used per capita income, urbanization, and population density to explain per capita interstate variations in various categories of government expenditures in 1942. The categories he examined were general control, police, fire, other public safety, highways, schools, sanitation, health and hospitals, public welfare, and other expenditures. Fabricant used income as an explanatory variable for two reasons. First, high income areas tend to have high price levels, making for higher government expenditures. Second, higher incomes result in greater demand and also greater supply due to a larger tax capacity. Urbanization plays a role because of the higher prices in urban areas and because larger cities tend to have greater per capita expenditures even with income held constant. Density was added because the more crowded an area is the more intensively public facilities can be used, thereby lowering per capita costs. Fabricant found that regressing per capita welfare expenditures on his three independent variables yielded a coefficient of multiple determination (R^2) value of .45.[1]

In two articles Glenn Fisher elaborated on Fabricant's work. Like Fabricant, Fisher's interests included but were not limited to public welfare. In his 1961 article he essentially replicated parts of Fabricant's study for the year 1957. Fisher's R^2 value was .14 when per capita welfare expenditures were regressed on Fabricant's three independent variables. Although the functional classification of government expenditures differed somewhat from that used in 1942 the results show other factors became important in determining welfare expenditures.[2] In 1964 Fisher published another study where he used data for 1960 and expanded the number of independent variables to seven. He replaced per capita income with an index of the per capita yield of a representative tax system and percent of families with income less than $2000 in 1959. The tax yield index measures the amount of revenue raised if all states were to adopt a hypothetical uniform tax system which is representative of the tax practices actually employed by the majority of the states. The fuller regression analysis for welfare yielded an R^2 value of .19 while for the original three independent variables it was .09.[3]

1

Solomon Fabricant, <u>The Trend in Government Activity in the United States Since 1900</u> (New York: National Bureau of Economic Research, 1952), pp. 112-139.

2

Glenn W. Fisher, "Determinants of State and Local Government Expenditure: A Preliminary Analysis," <u>National Tax Journal</u> vol. 14 (December 1961) : 349-355.

Seymore Sacks and Robert Harris increased the explanatory power of Fabricant's model by adding per capita federal aid to state and local governments and per capita state aid to local governments. Like Fabricant and Fisher, they used a variety of categories of per capita government expenditures. Inclusion of per capita federal aid had a significant impact on the proportion of explained variation in public welfare expenditures. For example, the coefficient of multiple determination of the welfare equations rose from .11 with the original three independent variables to .83 with the federal aid variable added. In light of this result, Sacks and Harris attribute the apparent decline in the importance of Fabricant's three variables over time to changes in the role of federal aid.[4]

Lora Collins also analyzed the determinants of public assistance expenditures. Unlike previous researchers, Collins focused exclusively on public welfare and she performed econometric analysis on Old Age Assistance, Aid to Dependent Children, Aid to the Blind, and Aid to the Permanently and Totally Disabled both separately and aggregated together. The dependent variables she used were per capita expenditures by different levels of govern-

---

3 Glenn W. Fisher, "Interstate Variation in State and Local Government Expenditures," National Tax Journal vol. 17 (March 1964) : 57-74.

4 Seymore Sacks and Robert Harris, "The Determinants of State and Local Government Expenditures and Intergovernmental Flow of Funds," National Tax Journal vol. 17 (March 1964) : 81-82.

ment, recipient rates (the proportion of the relevent population receiving aid), average monthly payment per recipient, and average monthly administrative expenditures per case. For ADC, the "relevant" population used in getting recipient rates were persons below eighteen years of age. The main explanatory variables measure income, degree of urbanization, the unemployment rate, racial composition, degree of social insurance coverage, and the rate of population growth.[5] The regressions concerning ADC led to several conclusions. The recipient rate was positively related to the percent of children living with their mother only and was negatively related to the nonwhite population percentage. Income, unemployment, and urbanization all played a role in determining recipient rates. Income and percentage nonwhite were important factors in explaining average ADC payments. Other social insurance had little impact on ADC.[6]

Peter Albin and Bruno Stein studied the level of expenditures for public assistance in each year from 1962 to 1965. They ran three different sets of regressions equations using states as the unit of observation. In the first group, the dependent variable was the ratio of effort to need. Albin and Stein measured effort with expenditures made by state and local governments net of federal

---

5 Lora S. Collins, "Public Assistance Expenditures in the United States" in Studies in the Economics of Income Maintenance ed. Otto Eckstein (Washington D.C.: The Brookings Institution, 1969), pp. 99-102.

6 Ibid., pp. 123-135.

intergovernmental grants and need by the average difference between earnings of persons in poverty and the poverty line. The independent variables included per capita tax receipts and attitude variables (percent nonagricultural population, percent nonwhite, and a measure of political conservatism). Per capita tax receipts were a proxy for the states' ability to pay. Only per capita tax receipts and the nonagricultural population percentage were significant although most of the other explanatory variables had the expected signs.

The second set of regressions explained both local and state public assistance expenditures from own tax receipts with lagged expenditures, changes in relief and nonrelief spending, and changes in state and federal financing of relief spending. These regressions attempted to capture the impact of shifts in financial responsibilities for relief among the different levels of governments. The results indicated increases in federal and local financing of public assistance tended to have a negative effect on state welfare spending. The relationship was stronger for changes in local spending than for changes in federal spending.

The third set of equations, which more resemble the those estimated by other researchers, use different measures of recipients and benefits as dependent variables. In the first equation, recipient rates (defined here as the ratio of actual to potential recipients) are regressed on the effort to need ratio and an index of conservatism. Both regressors were significant. The effort to need ratio coefficient had a positive sign and the degree of conservatism was negatively related to the recipient rate. Albin and Stein also regressed the number of recipients on the lagged number of recipients, the lagged benefit level, the change in the number unemployed, and the change in a measure of stringency in the administration of relief. The lagged recipient variable had a positive and significant effect while lagged benefits had a positive effect but were nonsignificant. There were mixed results with the stringency measure. Finally, regressions were made of the benefit level on lagged benefits, change in proportion of population receiving aid, change in per capita income, and a variable denoting whether the state gives AFDC to families with an unemployed male head. The results showed that lagged benefits had a strong effect on current benefits and that recipient rates were negatively related to benefits. In addition, a change in income and the AFDC unemployed parent provision had positive influences on the benefit level.[7]

During the late 1960's, economists began to recognize that transfer programs arise when an externality exists, that is, when taxpayers' utilities are affected by the income or consumption levels of the indigent. Harold Hochman and James Rogers, for example, discussed the Pareto optimality of income transfers when utility functions depend on own income and the incomes of other

---

7 Peter S. Albin and Bruno Stein, "Determinants of Relief Policy at the Sub-Federal Level," Southern Economic Journal vol. 37 (April 1971) : 445-454.

persons in society.[8] Lawrence Shall examined the transfers of goods between two persons when the utility functions of both individuals depend on own consumption and the consumption of the other party.[9] Daly and Giertz explored the optimality of income and in-kind transfers when the donor's utility is a function of both recipients' consumption of a specific good and their utility levels.[10] Lester Thurow considered interdependent utility functions to be one reason for the existence of public redistribution programs.[11] Uri Ben-Zion and Uriel Spiegel used interdependent preferences to build a model in which donors both subsidize specific goods and transfer income to the poor.[12]

---

8 Harold Hochman and James D. Rogers, "Pareto Optimal Redistribution," American Economic Review vol. 59 (September 1969) : 542-557.

9 Lawrence D. Shall, "Interdependent Utilities and Pareto Optimality," Quarterly Journal of Economics vol. 86 (February 1972) : 19-24.

10 George Daly and Fred Giertz, "Welfare Economics and Welfare Reform," American Economic Review vol. 62 (March 1972) : 131-138.

11 Lester D. Thurow, "The Income Distribution as a Pure Public Good," Quarterly Journal of Economics vol. 85 (May 1971) : 327.

12 Uri Ben-Zion and Uriel Spiegel, "Philanthropic Motives and Contribution Policy," Public Choice vol. 40 (Spring 1983) : 121-122.

B. Studies Estimating the Demand for Welfare Expenditures

None of the early empirical studies of public welfare were based on any explicit utility maximization model and there was no discussion of the mechanism by which the size of government expenditures is chosen. Furthermore, those studies which examined both the determinants of the number of recipients and benefit levels did not discuss their simultaneous determination. In the 1970's, economists began to apply public choice models to the estimation of demand functions for government expenditures. These studies typically use the Bowen-Downs majority voting model. Majority voting implies the median voter decides the outcome. For example, if the expenditure level is greater than that which the median voter prefers, a majority can be found which would support lower expenditures. The same process works to increase expenditures if they are lower than that preferred by the median voter.[13]

Thomas Borcherding and Robert Deacon were among the first to use the median voter model to estimate demand functions for different types of government expenditures. Their list of dependent variables is similar to Fabricant's although it does not include public welfare. Assuming a Cobb-Douglas production function with constant returns to scale, Borcherding and Deacon derive the subjective marginal tax price per unit of output to the median voter.

---

13 Robin W. Boadway, Public Sector Economics (Cambridge, Mass.: Winthrop Publishers, 1979), pp. 129-131.

They also assume the demand for per capita government expenditure is a log-linear function of tax price, income, state land area, and urbanization. Since the model they use indicates that tax price is a function of state population and input prices (the wage rate in this case), these two variables replace tax price in the demand equation they estimate. In their empirical results, the population parameter had a significantly positive sign in only three of the twelve expenditure categories examined. The coefficient of the urbanization variable was significant at the five percent level for only two categories. In over half the regressions income had a positive effect at the five percent level of significance. The price effects were negative except for highways and higher education, where they were positive but not significant.[14]

Theodore Bergstrom and Robert Goodman did a similar analysis for municipal public services. They build a tax price of expenditures to the median voter into the model. Unlike Borcherding and Deacon, who base their tax price on the marginal cost of producing government services, Bergstrom and Goodman derive their tax price using utility maximization. In their basic demand equations, they regressed police, parks and recreation, and total municipal expenditures excluding education and welfare on the number of households, tax share, and median income. In general, they found that income and population had a positive and significant impact of

---

14 Thomas E. Borcherding and Robert T. Deacon, "The Demand for the Services of Non-Federal Governments," American Economic Review vol. 62 (December 1972) : 891-901.

municipal expenditures. The tax price coefficient had a negative sign and was significant.[15]

Some work has been done in using public choice models to explain educational expenditures. For example, Michael Lovell estimated the demand for educational expenditures per pupil in Connecticut using the median voter model. His regressions supported the hypothesis that local educational expenditure are negatively related to measures of the tax burden faced by the median voter.[16] Robert Inman tested the median voter model using data on expenditures by Long Island school districts and found evidence that the median voter is decisive. In particular, median income, the tax share of the family with the median income, and state aid were almost always significant and had the correct sign in every case.[17]

The model used in this dissertation is based on two studies of public redistribution programs. The first, conducted by Larry Orr, estimates the demand for the AFDC benefit level. Orr was the first researcher to combine the interdependent utility and public choice models in deriving a demand function for income transfers.

15

Theodore C. Bergstrom and Robert P. Goodman, "Private Demands for Public Goods," American Economic Review vol. 63 (June 1973) : 280-296.

16

Michael C. Lovell, "Spending For Education: The Exercise of Public Choice," Review of Economics and Statistics vol. 60 (November 1978) : 487-495.

17

Robert P. Inman, "Testing Political Economy's 'As If' Proposition: Is the Median Income Voter Really Decisive?," Public Choice vol. 33 no. 4 (1978) : 45-46.

He assumed the median voter's utility is a function of his own income after tax and a vector of recipients' after-transfer incomes. With the number of recipients given, each taxpayer votes for the benefit level which sets his marginal cost (the loss of utility due to lower own-income) equal to marginal benefit (the gain in utility stemming from the gain in recipients' incomes). Any factor which affects the first-order equilibrium condition affects the demand for benefits. With majority rule the median level of preferred benefits gets chosen.

Orr used twelve variables to explain benefits per recipient; per capita income, the lagged ratio of AFDC recipients to total state population, the lagged number of AFDC recipients, the marginal state share of AFDC payments, average federal AFDC payments, four regional dummy variables, the fraction of nonwhite AFDC families, and two time variables. The ratio of recipients to total population was used because it affects the marginal cost of benefits to the taxpayer. For example, for a given population size it costs twice is much to raise benefits by one dollar if there are 200 recipients than if there are 100 recipients. The number of recipients was added to the demand equation because according to Orr's model when there are more recipients the taxpayer receives a higher marginal utility from an increase of a dollar in benefits since there are more people receiving the higher transfers. Hence, larger AFDC benefits would be demanded. Marginal state share and average federal share captured the marginal price effect and the income effect, respectively, of a change in the federal matching rate. The dependent variable was average real monthly payment per AFDC recipient.

Orr found that the coefficient of the federal AFDC benefits was not a good explanatory variable. Its coefficient had a small value and was insignificant. The marginal state share, on the other hand, had a negative and highly significant coefficient. The lagged AFDC recipient rate was significant and had a negative effect and the lagged number of recipients had a positive impact on the benefit level. The racial composition variable had a negative parameter. Many of the time and regional variables were nonsignificant.[18] No attempt was made to estimate the demand for AFDC recipients.

The other study on which the model developed in this dissertation is based was made by Thomas Grannemann. He estimated the demand for Medicaid and his model is in many respects an extention of Orr's. Grannemann added a demand for recipients equation. He took into account the cost to the taxpayer of the AFDC program in his theoretical work although he ignored it in his empirical analysis. The dependent variables he used included total Medicaid benefits, benefits per recipient, the number of recipients, the ratio of recipients to state population, aggregate state expenditures for health and hospitals, total inpatient hospital and physician services provided under Medicaid, the share of state

---

18 Larry L. Orr, "Income Transfers as a Public Good: An Application to AFDC," American Economic Review vol. 66 (June 1976) : 359-364.

taxpayer income used for Medicaid, and the number of optional Medicaid services offered in the state. Whenever possible, separate regressions were run for children, adult, and old recipients. The independent variables encompassed an index of medical costs, the number of taxpayers, a measure of the price of Medicaid to the taxpayer, taxpayer income, the number of persons below the poverty level, the Gini coefficient, various characteristics of the poor, percent of population living in metropolitan areas, percent completing high school, regional dummy variables, physicians and hospital beds per capita, and time dummy variables.

Grannemann assumed the median voter's utility depends on own consumption, a vector of consumption of nonmedical goods by all other state residents, a vector of consumption of medical care by all other state residents, and a vector of state characteristics. State residents fall into one of three groups. They may recieve both Medicaid and welfare, receive Medicaid only, or receive neither Medicaid nor welfare.[19] Grannemann tested several models but only those related to this dissertation shall be discussed. He got ordinary least squares estimates of the reduced form demand equations for the benefit level and number of recipients. He did not emphasize the simultaneous estimation of the demand for benefits and recipients because his model is difficult to identify.

---

19 Thomas W. Grannemann, "The Demand for Publicly Financed Medical Care: The Role of Interdependent Preferences," Evanston, Illinois: Northwestern University, August 1979, pp. 46-64.

He was able to estimate the simultaneous demand for benefits and recipients for recipients over the age of 65 because the reduced form estimates indicated that time is not related to the number of recipients in that age group, and he dropped the index of state medical care costs from the demand for benefits. Both old recipients and benefits were not significant at the five percent level. The model where benefits are treated as exogenous did better; when recipients were regressed, benefit levels were significant at the one percent level for old and adult recipients. In all cases, benefits had a negative sign, thereby supporting Grannemann's hypothesis that higher benefit levels increase the shadow price of the number of recipients.[20]

---

20 Ibid., pp. 79-92.

CHAPTER III

THE MODEL

Loosely following Grannemann and Orr, the model developed in this dissertation is based on the following assumptions:

(a) Society is composed of two mutually exclusive groups; the poor and the nonpoor

(b) The poor are subdivided into those receiving Medicaid only, those receiving both Medicaid and AFDC, and those receiving nothing

(c) In a given state the costs of the Medicaid and AFDC transfers are shared equally among the nonpoor

(d) In a given state all Medicaid and all AFDC recipients receive equal amounts of Medicaid and AFDC benefits, respectively

(e) The benefit levels and numbers of recipients of both programs are decided in each state by simple majority rule

The last assumption, (e), in conjunction with the assumptions of transitive social preferences (that is, repeated votes result in the same outcome) and no strategic behavior implies the median voter decides the number of recipients and benefit levels. It is also assumed that the median voter belongs to the nonpoor group.

The median voter in each state i is assumed to have a utility function of the form

$$(1) \quad U_i = U_i(C_i, s_i, w_i, m_i, b_i)$$

where C_i = own consumption

s_i = proportion of poor persons receiving medical subsidies

w_i = proportion of poor persons receiving welfare

m_i = medical care subsidies per recipient

b_i = welfare benefits per recipient.

Note that s_i includes those persons receiving Medicaid and AFDC as well as those who are recipients of Medicaid only.

There are several reasons why these particular arguments are used in the utility function. Previous reasearchers tended to assume utility is a function of a vector of other individuals' income, utility, or consumption of a particular good. This implies the taxpayer can differentiate among all the individual recipients. However, in reality, discrimination among recipients is difficult. Because of this, the utility function can be simplified to having one variable measuring the benefit level and one variable representing the number of recipients. This point was made by J. Giertz and Dennis Sullivan in their study of the Food Stamp Program.[21] The ratio of the number of recipients to the number of poor is used because one would expect the number of recipients to depend on the size of the state. Benefits are divided by the number of recipients

---

21 J. Fred Giertz and Dennis S. Sullivan, "Donor Optimization and the Food Stamp Program," Public Choice vol. 29 no. 2 (1977) : 24-25.

for the same reason.

Both Medicaid and AFDC are federal matching grant programs so the taxpayers as state taxpayers do not bear the full burden of financing the transfers. But as Orr points out, state taxpayers also pay federal taxes to cover the federal share. The average taxpayer's expenditures on Medicaid, then, in state i is

$$(2)\ MEDTAX_i = m_i s_i P_i G_i/STAX_i + m_i s_i P_i(1-G_i)/USTAX + m^O s^O P^O(1-G^O)/USTAX$$

Here, P_i = number of poor persons in the state

G_i = state percentage share of total Medicaid expenditures

m^O = average Medicaid benefits in all other states

P^O = total number of poor persons in all other states

s^O = average proportion of poor persons receiving Medicaid in all other states

G^O = average state percentage share in all other states

$STAX_i$ = number of taxpayers in the state

USTAX = number of taxpayers in the United States.

The derivation of equation (2) from the budget constraint Orr uses is shown in appendix A. The state share, G_i, varies from state to state and is computed from the formula given in the Social Security Act. The formula is

$$(3)\quad G_i = (S_i^2/N_i^2) \times .45$$

Here, S_i = three-year average state per capita personal income

N_i = three-year average national per capita personal income.

The federal share is simply $1-G_i$.[22] Although in some cases the local governments share part of the costs with the state it is assumed for simplicity that the state pays that portion of the transfers which the federal government does not cover.

The taxpayer's AFDC burden equation is analogous to the Medicaid liability equation:

$$(4)\ AFDCTAX_i = b_i w_i P_i H(b_i)/STAX_i + b_i w_i P_i [1-H(b_i)]/USTAX + b^O w^O P^O [1-H(b^O)]/USTAX$$

where $H(b_i)$ = average state percentage share of total AFDC expenditures

b^O = average benefits in all other states

$H(b^O)$ = average state percentage share in all other states

w^O = average proportion of poor persons receiving AFDC in all other states.

Appendix A demonstrates how equation (4) is derived. As with Medicaid it is assumed the state does not share the cost of the

---

22 U.S., Department of Health and Human Services, Social Security Administration, Annual Statistical Supplement to the Social Security Bulletin 1982 (Washington D.C.: Government Printing Office, 1982), p. 52.

program with local governments. The average state AFDC share is computed in a more complicated way than the Medicaid share is. In 1965 legislation was enacted allowing states a choice of two matching rate formulas. In the first (the "regular" or "original") AFDC formula, the state pays one-sixth of the first $18 each recipient gets per month. On any amount above $18 and equal to or below $32 the percentage is determined by the formula

$$(5)\quad M_i = (S_i^2/N_i^2) \times .50$$

The state share on the portion of benefits above $32 is 100 percent. If the second (the "alternate" or "Medicaid") formula is used, the state pays a constant share equal to the Medicaid share.[23] If the original formula is used, the matching rate depends on the size of the benefits, making it endogenous. Furthermore, with the original formula, the marginal and average state AFDC shares differ from each other.

Letting the price of C be one dollar, the Lagrangian function becomes

$$(6)\ L = U_i(C_i, s_i, w_i, m_i, b_i) + l[I_i - C_i - MEDTAX_i - AFDCTAX_i]$$

The first-order conditions give the following shadow prices:

---

23 Ibid.

(7a) $P_{si} = m_i p_i G_i$

(7b) $P_{mi} = s_i p_i G_i$

(7c) $P_{wi} = b_i p_i M_i$

(7d) $P_{bi} = w_i p_i M_i$

where the P_{ji}'s are the respective shadow prices, M_i is the marginal AFDC matching rate, and $p_i = P_i/STAX_i$. The derivations of the shadow prices are shown in appendix B. Note the shadow prices are endogenous. For example, if the AFDC benefit level increases, the cost to the taxpayer of increasing w (the proportion of poor persons receiving AFDC) rises. Stated more intuitively, the cost of extending welfare to one more person is higher if the benefit level is $2 than if it is $1.

It has been argued that Medicaid benefits are exogenous. In fact, one of the criticisms of the program is that costs are out of control. The benefits each recipient receives depends on his utilization of medical care resources. The amount of medical care consumed, in turn, is decided by the providers. As noted above, Grannemann did estimate a model where benefits are exogenous and found some evidence supporting this view. Because of this exogeneity and for reasons of identification, the demand for Medicaid benefits per recipient is dropped. Therefore only the three shadow prices P_s, P_w, and P_b are entered into the remaining demand equations.

The demand equations that are left are assumed to have the following structural forms:

$$(8a)\ \ln s_i = a_0 + a_1 \ln P_{si} + a_2 \ln P_{wi} + a_3 \ln P_{bi}$$

$$(8b)\ \ln w_i = b_0 + b_1 \ln P_{si} + b_2 \ln P_{wi} + b_3 \ln P_{bi}$$

$$(8c)\ \ln b_i = c_0 + c_1 \ln P_{si} + c_2 \ln P_{wi} + c_3 \ln P_{bi}$$

Substituting the definitions of the shadow prices into the structural demand equations it can be seen that in (8b) and (8c) the dependent variable is found on both sides of the equation. Because of this, the structural demand equations cannot be estimated as they are. Instead, the equations must be estimated indirectly by first regressing the quasi-reduced form and then solving for the structural parameters. Solving each individual equation for the dependent variable gives the quasi-reduced form equations:

$$(9a)\ \ln s_i = a_0 + a_1 \ln m_i + a_2 \ln b_i + a_3 \ln w_i + (a_1+a_2+a_3) \ln p_i + a_1 \ln G_i + a_2 \ln H_i + a_3 \ln M_i$$

$$(9b)\ \ln w_i = z_1b_0 + z_1b_1\ln m_i + z_1b_2\ln b_i + z_1(b_1+b_2+b_3)\ln p_i + z_1b_1\ln G_i + z_1b_2\ln H_i + z_1b_3\ln M_i$$

$$(9c)\ \ln b_i = z_2c_0 + z_2c_1\ln m_i + z_2c_3\ln w_i + z_2(c_1+c_2+c_3)\ln p_i + z_2c_1\ln G_i + z_2c_2\ln H_i + z_2c_3\ln M_i$$

where $z_1=1/(1-b_3)$ and $z_2=1/(1-c_2)$.

Restrictions must be added to the quasi-reduced form in order to be able to solve for the structural coefficients. In the Medicaid demand equation, the reduced-form coefficients of $\ln m_i$ and $\ln G_i$, of $\ln b_i$ and $\ln H_i$, and of $\ln w_i$ and $\ln M_i$ are set equal to each other. In addition, a fourth restriction constrains the sum of the coefficients of $\ln m_i$, $\ln b_i$, and $\ln w_i$ to be equal to the coefficient of $\ln p_i$.

The demand for the AFDC recipient rate equation has three restrictions placed on the quasi-reduced form. One restriction sets the coefficients of $\ln m_i$ and $\ln G_i$ equal to each other. Another does the same for $\ln b_i$ and $\ln H_i$. A third restriction forces the parameter estimates of $\ln p_i$ to have the same value as the sum of the coefficient estimates of $\ln m_i$, $\ln b_i$, and $\ln M_i$. Three similar restrictions placed on the demand for AFDC benefits equation. The coefficients of $\ln m_i$ and $\ln G_i$ are constrained to be the same as are the coefficients of $\ln w_i$ and $\ln H_i$. A third restriction sets the sum of the estimated parameters of $\ln m_i$, $\ln H_i$, and $\ln M_i$

equal to the coefficient of ln p_i. Without the restrictions the quasi-reduced form Medicaid recipient ratio demand equation is just identified and the other two equations are overidentified. When the restrictions are added, all equations become overidentified.

Some predictions can be made of the signs of the structural parameters. The own-price elasticities a_1, b_2, and c_3 are expected to be negative. To keep the signs from switching when the structural equations are transformed into the quasi-reduced form equations, both b_3 and c_2 must be less than one. For example, in (8b) P_w has a negative sign. Therefore, H, which is a component of P_w, should also have a negative impact on w. An examination of (9b) shows this is possible only if b_3 has a value smaller than unity. The same reasoning holds for the third equation. It should be kept in mind that these predictions assume real income is fixed. In the empirical analysis income effects are introduced because money income is held constant.

CHAPTER IV

EMPIRICAL IMPLEMENTATION OF THE MODEL

A. Econometric Methods Used in Estimation

The system of simultaneous demand equations is estimated using the methods of limited information maximum likelihood and two stage least squares. It is assumed that the supply curves of benefits and recipients are perfectly elastic. Both Orr and Grannemann implicitly make this assumption.

Special attention is given to the endogeneity of M and H. As discussed above the proportion of AFDC benefits covered by the federal government is a function of the benefit level if the state is subject to the original formula. There are no simple equations describing the functions $H(b_i)$ and $M(b_i)$ since both functions are discontinuous. To take account of this endogeneity Orr's methodology is used. First, using limited information simultaneous equations techniques, the demand function for the AFDC benefit level is estimated but without including ln H and ln M in the set of explanatory variables. This equation can be expressed as

$$(10)\quad \ln b_i = Xz_0 + u_i$$

where X is a vector of explanatory variables in the AFDC benefits equation excluding $\ln H_i$ and $\ln M_i$ and z_0 is a vector of coefficients. For those states utilizing the original AFDC formula the predicted level of benefits is obtained by

$$(11)\ \ln b_i^e = Xz_0$$

where b_i^e is the predicted AFDC benefit level. Using the AFDC formula for the marginal state share described in chapter III, the marginal and average shares corresponding to b_i^e are computed. Finally, equations (9a) through (9c) are regressed with the predicted shares replacing the actual shares for the states that are on the original formula.

There are several variables that are used both as numerators and denominators of the dependent and independent variables. For example, the number of poor persons is used in obtaining p_i (the proportion of state population who are poor), s_i (the proportion of poor persons on Medicaid), and w_i (the proportion of poor persons on AFDC). Errors in the measurement of the number of poor persons would bias the coefficient estimates. The direction of bias cannot be unambiguously predicted. Data on AFDC and Medicaid are based on the universe so measurement errors of benefits and recipients can be assumed to be negligible. Although the quality of Medicaid data has been severely criticized, states make an effort to keep the financial data accurate since this information is used for fiscal purposes.[24]

B. Description of the Data

In addition to the price variables (those variables appearing in the definitions of the shadow prices), several nonprice variables are entered into the demand equations. The nonprice variables employed pertain to schooling, income, racial composition, percent of population living in urban areas, availablilty of medical facilities, unemployment, climate, geographic location, and time. The complete list of variables and their definitions is given in table 1. Summary statistics are given in table 2. The sources of the data are listed in appendix C. Except for the regional and time dummy variables, all variables are entered in natural logs.

The unit of observation is the state in a given year. The years examined are 1976 through 1981. There are fifty observations in each year (49 states and the District of Columbia). Arizona does not participate in the Medicaid program. Years prior to 1976 are deleted for two reasons. The first is that before 1975 the AFDC matching rate was affected by all categorical assistance programs (i.e., OAA, AB, and APTD). The second reason is that prior to 1976 the fiscal year for which both the AFDC and Medciad state shares are set ran from July to June. In mid-decade it changed to October through September.

The median years of education captures the median voter's

---

24 Emil Berkanovic,"An Appraisal of Medicaid Records as a Data Source," Medical Care vol. 12 (July 1974) : 594.

TABLE 1

DEFINITIONS OF VARIABLES

Variable Name	Definition
Dependent Variables	
MEDPOV	ratio of Medicaid recipients to poverty population
AFDCPOV	ratio of AFDC recipients to poverty population
AFDCBEN	average monthly AFDC benefit per recipient
Price Variables	
MEDBEN	average monthly Medicaid benefit per recipient
POOR	proportion of population in poverty
MEDSHR	marginal state Medicaid share
MARSHR	marginal state AFDC share
AVGSHR	average state AFDC share
Nonprice Variables	
EDUC	median years of schooling completed
INCOME	per capita personal income
BLACK	percent of population that is black
URB	percent of population living in urban areas in 1980
MEDINDEX	index of market medical prices
PHYS	number of physicians per capita
UNEMP	unemployment rate
TEMP	average January temperature
NE,NC,S	dichotomous variables for North East, North Central, and South (omitted category is West)
T76-T80	dichotomous year variables
Structural Equation Price Variables	
P_s	shadow price of proportion of poor persons receiving Medicaid
P_w	shadow price of proportion of poor persons receiving AFDC
P_b	shadow price of monthly AFDC benefits

TABLE 2

SUMMARY STATISTICS
OF SELECTED VARIABLES

Variable Name	Mean	Standard Deviation	Minimum Value	Maximum Value
MEDPOV	-0.8992	0.6140	-2.8341	0.3169
AFDCPOV	-1.1016	0.4701	-2.2168	0.0128
AFDCBEN	4.0974	0.3954	2.5877	5.0261
MEDBEN	2.1000	0.4825	1.1207	3.9580
POOR	-2.1435	0.2870	-2.7162	-1.3594
MEDSHR	-0.9276	0.2231	-1.5269	-0.6931
MARSHR	-0.8617	0.3173	-1.7918	0.0000
AVGSHR	-0.9251	0.2413	-1.7918	-0.3682
EDUC	2.5243	0.0150	2.4932	2.5495
INCOME	8.7502	0.1500	8.1531	9.1790
BLACK	-3.1415	1.5572	-6.6851	-0.1630
URB	4.1824	0.2354	3.5205	4.6052
NE	0.1800	0.3848	0.0000	1.0000
NC	0.2400	0.4278	0.0000	1.0000
S	0.3400	0.4745	0.0000	1.0000
PHYS	-6.4475	0.2957	-6.9239	-5.1287
MEDINDEX	0.2350	0.2091	-0.2235	0.8354
UNEMP	1.8366	0.2871	1.0296	2.5337
TEMP	3.3780	0.4363	1.9021	4.2850

tastes. The percentage black, urbanization, and regional dummy variables represent state characteristics. Higher levels of urbanization are expected to lower per capita administrative costs and hence be associated with greater demand.

The number of physicians per capita is used by Grannemann as a measure of the availability of medical resources. If voters feel the medical care the poor get competes with their own use then fewer recipients will be demanded. The unemployment rate is expected to influence the demand for AFDC recipients. Voters are expected to demand more recipients the higher the unemployment is. A climatic variable is entered as a regressor because there is a greater need for clothing and shelter in states with a harsher climate and hence, voters would be willing to finance larger benefits in these areas. The normal daily mean temperature in January is used. For most states it is reported for one city. If temperatures for more than one city are available, then a weighted average is taken. The weights are the 1976 SMSA population.

Medicaid benefits are divided by a Medicaid index to reflect real benefits. In general, states choose their own Medicaid reimbursement practices. The only exception is inpatient hospital services, for which Medicare reimbursement procedures must be used unless there is federal approval of another method of reimbursement. For most other services, the only requirement states must adhere to is that the Medicaid reimbursement rate must not be greater than the Medicare rate. For long term institutional care services there is the added requirement that payments must be related to costs. Consequently, there is a wide variety of reimbursement practices. Since rates are decided by the state governments the rates do not necessarily reflect market medical prices. Hence, a Medicaid-specific index should be used.

To construct the index, use is made of a statewide index of payments to physicians under Medicaid for 1975 that was calculated by Ira Burney et al. They computed their index from the reimbursement methods for frequently performed procedures. An effort was made to correct for differences in the mix of services provided and differences in practice costs.[25] In order to create an index from the Burney state data, it is assumed that the relative state differences in physician fees remain constant over time and that the index is highly correlated with the relative price differences in other Medicaid-provided services. The medical component of the national Consumer Price Index, which has a base year of 1967, is divided by its 1975 value to approximate an index with a base year of 1975. The index used to deflate Medicaid benefits is created by multiplying the adjusted CPI index by the state-specific index of Medicaid payments. It should be noted that the medical component of the CPI is only an approximation of the changes in prices paid for Medicaid services. For example, it tends to overstate the rise in payments to physicians and understate reimbursements to

---

25 Ira L. Burney et al. "Geographic Variation in Physicians' Fees: Payments to Physicians Under Medicare and Medicaid," Journal of the American Medical Association vol. 240 (September 22, 1978) : 1369-1370.

hospitals.[26]

An index of market medical prices is added to the demand for Medicaid recipients equation. The index is used because a higher market price of medical care discourages the poor from seeking medical aid. Donors would then have an incentive to demand more Medicaid recipients. Burney et al. computed a statewide index of Medicare payments to physicians for 1975. The construction of the Medicare index is similar to that of the the Medicaid index. Because physician fees under Medicare are computed using the CPR (customary, prevailing, and reasonable charge) method, the reimbursement rates mimick the private market.[27] To create the market price index the data compiled by Burney et al. are multiplied by the medical component of the CPI. As with the Medicaid index described above the CPI figures are divided by their 1975 value.

Income and AFDC benefits are also expressed in real terms. An index is computed from data on personal income in current and constant 1972 dollars. First, to get an index with a base year of 1972, the nominal income is divided by real income. It is then multiplied by a state-specific Laspeyres index for 1972 that was computed by Fuchs, Michael, and Scott.[28] Since the statewide

---

26 Karen Davis and Cathy Schoen, Health and the War on Poverty: A Ten-Year Appraisal (Washington D.C.: The Brookings Institution, 1978), p. 59.

27 Burney et al. "Geographic Variation in Physicians' Fees: Payments to Physicians Under Medicare and Medicaid," pp. 1369-1370.

index is not available for Washington D.C., the average of Maryland and Virginia is used. To make this index compatible with the Medicaid index it is divided by its 1975 value. Income and benefits are deflated using this index.

During the period under study, the AFDC and Medicaid federal shares have been set every two years beginning in September. Recipient and benefit data are reported for the calendar year. The average AFDC state share is computed by dividing the benefits payed out by each state by the total benefits in each state. Both the AFDC and Medicaid benefits are converted to monthly figures by dividing the yearly data by twelve.

The number of persons below the poverty level in each state is available only for the years 1975 and 1979. Data for 1976 through 1978 are interpolated assuming a constant yearly percentage rate of change. The series is extrapolated for the years 1980 and 1981 using the same rate of change. All observations are then multiplied by the ratio of published US total population in poverty to interpolated US totals so that the sum of estimated values would equal the published values. The number of blacks in each state is available only for 1976 and 1980. The same methodology is applied in estimating the black population figures for the missing years.

---

28 Victor R. Fuchs, Robert T. Michael, and Sharon R. Scott, "A State Price Index," NBER Working Paper 320, February 1979, National Bureau of Economic Research, Cambridge, Mass.

CHAPTER V

REGRESSION RESULTS

The linear equality restrictions applied to the regression equations and the predictions the model makes are summarized in table 3. F tests are applied to the linear restrictions. The F statistic is computed by dividing the difference between the residual sum of squares of the restricted and unrestricted equations (corrected for degrees of freedom) by the sum of squares of the unrestricted equation (also corrected for degrees of freedom). As discussed above, the equations are estimated in a two step process. First, the AFDC benefit demand function is estimated with the two AFDC shares excluded from the set of explanatory variables. In the second step, the three demand equations are estimated with the predicted AFDC average and marginal state shares included as regressors.

In the first step, the removal of the two AFDC shares leaves only one restriction in the AFDC benefit equation. A test is performed on the hypothesis that the coefficients of MEDBEN and MEDSHR are equal. The F statistic has a value of 39.65, making it highly significant. Therefore, the hypothesis that the two parameters are of equal value must be rejected. Because of this result, no

TABLE 3

SUMMARY OF RESTRICTIONS AND PREDICTIONS

Dependent Variable	Restrictions and Predictions
MEDPOV	Parameter Restrictions: POOR-MEDSHR-AVGSHR-MARSHR=0 MEDBEN-MEDSHR=0 AFDCBEN-AVGSHR=0 AFDCPOV-MARSHR=0
	Quasi-Reduced Form Predictions: MEDBEN, MEDSHR<0
	Structural Form Predictions: $P_s<0$
AFDCPOV	Parameter Restrictions: POOR-MEDSHR-AVGSHR-MARSHR=0 MEDBEN-MEDSHR=0 AFDCBEN-AVGSHR=0
	Quasi-Reduced Form Predictions: AFDCBEN, AVGSHR<0
	Structural Form Predictions: $P_w<0$, $P_b<1$
AFDCBEN	Parameter Restrictions: POOR-MEDSHR-AVGSHR-MARSHR=0 MEDBEN-MEDSHR=0 AFDCPOV-MARSHR=0
	Quasi-Reduced Form Restrictions: AFDCPOV, MARSHR<0
	Structural Form Predictions: $P_b<0$, $P_w<1$

restrictions are used in the first step.

The restricted two stage least squares estimates of the quasi-reduced form are given in table 4 and the restricted limited information maximum liklihood results are in table 5. The two estimation methods give similar results so only the maximum liklihood estimates shall be discussed. Since the restrictions set the coefficients of MEDBEN and MEDSHR, of AFDCBEN and AVGSHR, and of AFDCPOV and MARSHR equal to each other, both variables in each pair have the same effect on the dependent variable. As can be seen in table 5, the demand for the proportion of poor persons on Medicaid is inversely related to the Medicaid benefit level and state share, as was predicted. Except for the AFDC recipient rate, the marginal AFDC state share and percent poor, the price variables are highly significant.

The nonprice variables are all significant at the one percent level except for three dichotomous variables and urbanization, which is significant at the five percent level. It is surprising that high levels of median years of education are associated with low Medicaid benefits to the extent indicated by the regression. One explanation may be that the further socially and economically removed a voter is from the poor the more inaccurate his notions of who receives Medicaid may be. The common misperception of the typical Medicaid recipient being a single black mother on welfare may lower the demand for the recipient rate if the median voter is prejudiced against blacks.

The hypothesis that more urbanized states have higher

TABLE 4

RESTRICTED 2SLS ESTIMATES OF QUASI-REDUCED FORM

Independent Variables	Dependent Variables		
	MEDPOV	AFDCPOV	AFDCBEN
INTERCEPT	32.764 (5.843)	-17.975 (-3.646)	-26.560 (-5.855)
AFDCPOV	-0.032 (-0.545)		0.010 (0.143)
AFDCBEN	0.457 (4.862)	0.332 (4.819)	
MEDBEN	-0.519 (-11.059)	-0.175 (-3.881)	0.065 (1.300)
POOR	-0.094 (-0.930)	-0.125 (-1.623)	-0.001 (-0.010)
MEDSHR	-0.519 (-11.059)	-0.175 (-3.881)	0.065 (1.300)
MARSHR	-0.032 (-0.545)	-0.282 (-5.537)	0.010 (0.143)
AVGSHR	0.457 (4.862)	0.332 (4.819)	-0.076 (-0.542)
EDUC	-13.932 (-6.139)	2.873 (1.379)	10.584 (5.532)
INCOME	0.718 (6.386)	0.632 (6.099)	0.389 (3.105)
BLACK	0.080 (3.347)	0.118 (6.086)	-0.002 (-0.110)
URB	0.229 (2.032)	0.372 (3.634)	0.201 (1.828)
T76	-0.574 (-5.119)	0.557 (10.481)	0.011 (0.145)

TABLE 4 - concluded

Independent Variables	Dependent Variables		
	MEDPOV	AFDCPOV	AFDCBEN
T77	-0.481 (-5.136)	0.545 (10.176)	-0.009 (-0.115)
T78	-0.522 (-6.597)	0.548 (9.850)	-0.0006 (-0.008)
T79	0.026 (0.414)	0.378 (7.469)	-0.0004 (-0.008)
T80	0.020 (0.387)	0.252 (5.316)	-0.045 (-0.882)
NE	0.331 (5.334)	0.520 (10.286)	0.206 (3.056)
NC	-0.023 (-0.402)	0.287 (5.136)	0.069 (1.047)
S	-0.440 (-5.801)	0.006 (0.088)	-0.168 (-2.297)
PHYS	0.943 (9.284)		
MEDINDEX	-0.669 (-3.167)		
UNEMP		0.547 (8.476)	
TEMP			-0.128 (-2.021)
F Ratio	96.43	57.97	35.07
R^2	.85	.77	.66

Note: T values are in parentheses.

TABLE 5

RESTRICTED LIML ESTIMATES OF
QUASI-REDUCED FORM

Independent Variables	Dependent Variables		
	MEDPOV	AFDCPOV	AFDCBEN
INTERCEPT	32.788 (5.843)	-18.154 (-3.642)	-26.928 (-5.891)
AFDCPOV	-0.033 (-0.557)		-0.013 (-0.180)
AFDCBEN	0.457 (4.838)	0.327 (4.562)	
MEDBEN	-0.519 (-11.050)	-0.174 (-3.835)	0.062 (1.220)
POOR	-0.095 (-0.941)	-0.130 (-1.655)	0.0009 (0.009)
MEDSHR	-0.519 (-11.050)	-0.174 (-3.835)	0.062 (1.220)
MARSHR	-0.033 (-0.557)	-0.283 (-5.545)	-0.013 (-0.180)
AVGSHR	0.457 (4.838)	0.327 (4.562)	-0.048 (-0.331)
EDUC	-13.937 (-6.137)	2.942 (1.399)	10.630 (5.529)
INCOME	0.718 (6.385)	0.632 (6.096)	0.411 (3.211)
BLACK	0.080 (3.351)	0.118 (6.082)	0.0009 (0.041)
URB	0.228 (2.019)	0.372 (3.633)	0.212 (1.910)
T76	-0.573 (-5.112)	0.556 (10.405)	0.027 (0.336)

TABLE 5 - concluded

Independent Variables	Dependent Variables MEDPOV	AFDCPOV	AFDCBEN
T77	-0.481 (-5.130)	0.544 (10.092)	0.006 (0.073)
T78	-0.522 (-6.591)	0.547 (9.793)	0.011 (0.147)
T79	0.026 (0.414)	0.378 (7.456)	0.006 (0.104)
T80	0.020 (0.388)	0.251 (5.300)	-0.040 (-0.774)
NE	0.331 (5.326)	0.521 (10.262)	0.220 (3.176)
NC	-0.023 (-0.404)	0.288 (5.131)	0.073 (1.102)
S	0.441 (5.815)	-0.007 (-0.092)	-0.172 (-2.336)
PHYS	0.945 (9.297)		
MEDINDEX	-0.669 (-3.160)		
UNEMP		0.549 (8.465)	
TEMP			-0.127 (-1.989)
F Ratio	96.29	57.75	34.75
R^2	.85	.77	.66

Note: T values are in parentheses.

recipient rates is supported by the data. The number of physicians per capita has the correct sign. The index of market medical prices has a negative sign, contrary to expectations.

In the demand for the AFDC recipient rate, the AFDC benefit and average share have parameters with a sign greater than zero, opposite of what is expected since it implies that the own-price effect is positive. All the price variables are significant at the ninety-nine percent confidence level except for percent poor. Education is not as important as in the other two equations although income, percent black, and urbanization are powerful regressors. Unemployment has a high t value and it also has the expected effect on the demand for the AFDC recipient rate.

The empirical results of the third demand equation show that the signs of the AFDC recipient rate and marginal share are negative as predicted. However, all price variables are nonsignificant. Education has a large and significant parameter value. Income is significantly positive. Percent black has a coefficient value close to zero. Urbanization has a positive coefficient and is not significant. Average January temperature is significant only at the five percent level and has the correct sign.

Table 6 shows the estimates of the structural parameters based on the maximum liklihood regressions of the quasi-reduced form demand equations. Five predictions have been made of the structural price parameters. The estimates are in agreement with four predictions. The own-price elasticity in the Medicaid equation is negative, as expected. What is not expected is the positive own-

TABLE 6

ESTIMATES OF STRUCTURAL PARAMETERS BASED ON LIML

Independent Variables	Dependent Variables MEDPOV	AFDCPOV	AFDCBEN
INTERCEPT	32.788	-25.310	-28.283
P_s	-0.519	-0.242	0.065
P_w	0.457	0.456	-0.046
P_b	-0.033	-0.394	-0.014
EDUC	-13.937	4.102	11.164
INCOME	0.718	0.881	0.432
BLACK	0.080	0.165	0.001
URB	0.228	0.519	0.223
T76	-0.573	0.775	0.028
T77	-0.481	0.758	0.006
T78	-0.522	0.762	0.011
T79	0.026	0.527	0.006
T80	0.020	0.351	-0.042
NE	0.331	0.727	0.231
NC	-0.023	0.402	0.077
S	-0.441	0.010	-0.181
PHYS	0.945		
MEDINDEX	-0.669		
UNEMP		0.765	
TEMP			-0.133

price elasticity in the AFDC recipient rate equation. In the demand for benefits, the own-price elasticity is negative but small in absolute value. The remaining two predictions, that the cross-price elasticities of the AFDC recipient rate and benefits are less than one, have held.

Removal of the restrictions has a profound effect on the equation estimates. The equations were run with the restrictions removed and the results are shown in table 7. Comparison of table 7 with table 5 shows the two recipient rate equations suffer a dramatic decline in the F ratios and R^2 values. All variables in the Medicaid equation become nonsignificant. In the AFDC recipient rate regression, only percent black is significant at the one percent level while the AFDC benefit level, Medicaid share, urbanization, and the year dummy variable for 1980 are significant at the five percent level. The F tests of the validity of restrictions indicate the hypothesis that the restrictions do apply should be accepted. For the third equation, the R^2 rises from .66 to .82 and the F ratio increases from 34.75 to 67.63 when unrestricted regressions are run. The F statistic for a test of the restrictions have a value of 76.18 so the hypothesis that the restrictions are valid is rejected. However, some coefficients such as those of income and temperature lose their significance when the restrictions are taken away. On the other hand, the proportion of people on AFDC, percent black, and the Medicaid and marginal AFDC matching rates increase in their significance.

Regressions are also run using weighted data. The weights

TABLE 7

UNRESTRICTED LIML ESTIMATES OF
QUASI-REDUCED FORM

Independent Variables	Dependent Variables		
	MEDPOV	AFDCPOV	AFDCBEN
INTERCEPT	83.071 (0.290)	11.551 (0.535)	-3.472 (-0.944)
AFDCPOV	0.094 (0.072)		0.174 (2.802)
AFDCBEN	-9.505 (-0.201)	4.492 (2.371)	
MEDBEN	-0.722 (-0.551)	-0.159 (-1.034)	0.016 (0.422)
POOR	-2.000 (-0.198)	0.029 (0.080)	-0.031 (-0.412)
MEDSHR	9.786 (0.209)	-5.731 (-2.000)	1.286 (5.200)
MARSHR	-3.873 (-0.214)	1.463 (1.807)	-0.338 (-5.523)
AVGSHR	0.585 (0.159)	0.106 (0.102)	-0.045 (-0.195)
EDUC	-12.967 (-0.608)	-14.608 (-1.371)	3.416 (2.305)
INCOME	2.473 (0.270)	-0.084 (-0.172)	0.048 (0.498)
BLACK	-0.786 (-0.201)	0.376 (2.826)	-0.076 (-4.383)
URB	-2.275 (-0.184)	0.829 (2.018)	-0.139 (-1.614)
T76	2.822 (0.170)	0.088 (0.296)	0.011 (0.179)

TABLE 7 - concluded

Independent Variables	MEDPOV	AFDCPOV	AFDCBEN
	Dependent Variables		
T77	2.253 (0.168)	0.111 (0.389)	0.007 (0.107)
T78	1.316 (0.144)	0.268 (1.124)	-0.023 (-0.414)
T79	0.885 (0.206)	0.329 (1.903)	-0.051 (-1.248)
T80	-0.037 (-0.088)	0.438 (2.453)	-0.086 (-2.285)
NE	0.306 (0.595)	-0.084 (-0.257)	0.034 (0.640)
NC	0.533 (0.214)	0.105 (0.516)	-0.028 (-0.576)
S	-1.508 (-0.252)	0.134 (0.519)	-0.029 (-0.520)
PHYS	3.912 (0.250)		
MEDINDEX	4.641 (0.186)		
UNEMP		0.243 (0.939)	
TEMP			-0.045 (-0.960)
F Ratio	1.52	4.71	67.63
R^2	.10	.24	.82
F Test (of Restrictions)	.10	1.68	76.18

Note: T values are in parentheses.

TABLE 8

WEIGHTED RESTRICTED LIML ESTIMATES
OF QUASI-REDUCED FORM

Independent Variables	Dependent Variables		
	MEDPOV	AFDCPOV	AFDCBEN
INTERCEPT	20.738 (3.059)	-6.777 (-1.288)	-28.847 (-4.444)
AFDCPOV	-0.122 (-2.322)		-0.229 (-3.417)
AFDCBEN	0.166 (2.182)	0.343 (7.899)	
MEDBEN	-0.398 (-8.883)	-0.247 (-6.481)	-0.147 (-2.810)
POOR	-0.353 (-3.459)	-0.032 (-0.519)	0.324 (2.920)
MEDSHR	-0.398 (-8.883)	-0.247 (-6.481)	-0.147 (-2.810)
MARSHR	-0.122 (-2.322)	-0.128 (-3.247)	-0.229 (-3.417)
AVGSHR	0.166 (2.182)	0.343 (7.899)	0.701 (5.134)
EDUC	-8.945 (-3.136)	-0.489 (-0.211)	12.954 (4.526)
INCOME	0.949 (7.790)	0.742 (7.690)	0.381 (2.699)
BLACK	0.168 (6.210)	0.229 (11.291)	0.102 (3.381)
URB	-0.306 (-1.805)	-0.115 (-1.050)	-0.064 (-0.420)
T76	-0.288 (-2.572)	0.511 (12.600)	0.333 (4.560)

TABLE 8 - concluded

Independent Variables	Dependent Variables MEDPOV	AFDCPOV	AFDCBEN
T77	-0.298 (-3.270)	0.486 (11.856)	0.332 (4.598)
T78	-0.423 (-5.584)	0.448 (10.070)	0.299 (4.556)
T79	0.127 (2.160)	0.239 (5.888)	0.115 (2.172)
T80	0.064 (1.361)	0.174 (4.976)	0.036 (0.762)
NE	0.161 (2.375)	0.260 (4.850)	0.202 (2.536)
NC	-0.183 (-3.193)	-0.003 (-0.067)	-0.245 (-2.822)
S	-0.866 (-9.973)	-0.631 (-9.516)	-0.608 (-6.990)
PHYS	0.951 (7.266)		
MEDINDEX	0.043 (0.204)		
UNEMP		0.266 (4.424)	
TEMP			-0.400 (-4.591)
F Ratio	110.47	115.95	52.50
R^2	.87	.87	.75

Note: T values are in parentheses.

TABLE 9

ESTIMATES OF STRUCTURAL PARAMETERS BASED ON WEIGHTED LIML

Independent Variables	Dependent Variables		
	MEDPOV	AFDCPOV	AFDCBEN
INTERCEPT	20.738	-7.776	-16.962
P_s	-0.398	-0.283	-0.086
P_w	0.166	0.393	0.412
P_b	-0.122	-0.147	-0.135
EDUC	-8.945	-0.561	7.617
INCOME	0.949	0.851	0.224
BLACK	0.168	0.263	0.060
URB	-0.306	-0.132	-0.038
T76	-0.288	0.586	0.196
T77	-0.298	0.558	0.195
T78	-0.423	0.514	0.176
T79	0.127	0.274	0.067
T80	0.064	0.200	0.021
NE	0.161	0.298	0.119
NC	-0.183	-0.004	-0.144
S	-0.886	-0.724	-0.358
PHYS	0.951		
MEDINDEX	0.043		
UNEMP		0.305	
TEMP			-0.235

TABLE 10

WEIGHTED UNRESTRICTED LIML ESTIMATES
OF QUASI-REDUCED FORM

Independent Variables	Dependent Variables		
	MEDPOV	AFDCPOV	AFDCBEN
INTERCEPT	-1.405 (-0.131)	-10.425 (-1.379)	5.879 (1.187)
AFDCPOV	-0.015 (-0.070)		0.097 (0.509)
AFDCBEN	1.378 (2.776)	1.338 (3.783)	
MEDBEN	-0.437 (-5.974)	-0.169 (-3.064)	-0.016 (-0.257)
POOR	0.237 (1.198)	-0.417 (-3.196)	0.084 (0.883)
MEDSHR	-0.175 (-0.528)	-1.436 (-4.099)	0.689 (3.309)
MARSHR	0.130 (0.936)	0.275 (2.216)	-0.280 (-5.735)
AVGSHR	-1.155 (-2.465)	-0.583 (-1.318)	0.997 (4.453)
EDUC	-3.811 (-1.090)	-2.021 (-0.650)	0.768 (0.348)
INCOME	0.789 (3.894)	0.586 (4.359)	-0.038 (-0.226)
BLACK	0.265 (3.694)	0.288 (8.164)	-0.071 (-1.348)
URB	0.440 (1.166)	0.428 (1.915)	-0.320 (-2.699)
T76	-0.838 (-3.429)	0.221 (2.437)	0.130 (1.233)

TABLE 10 - concluded

Independent Variables	Dependent Variables MEDPOV	AFDCPOV	AFDCBEN
T77	-0.737 (-3.575)	0.194 (2.122)	0.138 (1.407)
T78	-0.694 (-4.719)	0.242 (3.181)	0.085 (1.017)
T79	-0.053 (-0.572)	0.167 (2.974)	0.024 (0.531)
T80	-0.005 (-0.086)	0.162 (3.512)	-0.023 (-0.562)
NE	0.311 (3.452)	0.153 (2.016)	-0.035 (-0.610)
NC	-0.070 (-0.909)	0.140 (1.521)	-0.263 (-2.902)
S	-0.523 (-2.346)	-0.355 (-2.921)	-0.175 (-1.028)
PHYS	0.373 (1.365)		
MEDINDEX	-0.906 (-2.204)		
UNEMP		0.334 (4.137)	
TEMP			-0.154 (-1.948)
F Ratio	85.41	58.00	111.93
R^2	.87	.80	.88
F Test (of Restrictions)	3.32	5.91	88.38

Note: T values are in parentheses.

used are the number of persons below the poverty level. The weighted restricted estimates are shown in table 8. In the demand for Medicaid equation, weighting raises the t-ratios of the percentage in poverty, percentage on AFDC, and marginal AFDC share variables. Medicaid benefits continue to have a negative and significant effect. However, the coefficient of the medical market price index becomes indistinguishable from zero.

The signs of the education and urbanization coefficients are altered and urbanization loses its significance in the AFDC recipient rate equation. There is little change in the value of the AFDC benefit and average share coefficients. The unemployment elasticity falls but remains significant. In the third equation, the proportion of poor on AFDC continues to have a negative impact. The Medicaid benefit level and state share become significant. Temperature becomes more elastic and significant at the five percent level. Weighting generally improves the significance of the regressors.

Table 9 gives the structural parameter estimates based on table 8. As in the unweighted case, all the statements theory makes concerning the values of the structural coefficients are supported except for the positive AFDC recipient rate own-price elasticity.

Unrestricted and weighted regressions are also run. Comparison of table 10 with table 8 reveals several sign changes. In the demand for Medicaid, the percent poor, the two AFDC shares, and urbanization reverse their signs. Except for the two benefit levels and average AFDC share, the price variables suffer losses in significance. Physicians per capita becomes nonsignificant while market medical prices changes its sign and becomes significant at the five percent level. The F statistic computed to test the restrictions has a value of 3.32, which is significant at the five percent level.

In the second equation, the two AFDC state share variables reverse their signs and the average share gets a lower t value. Education remains nonsignificant. Unemployment still has a strong positive effect. The F value of the test of restrictions is 5.91. Therefore, the data does not support the hypothesis that the restrictions apply.

There are four major sign alterations in the AFDC benefit equation. They are for the AFDC recipient rate, Medicaid share, income, and percent black. With the exception of the three share variables, urbanization, and the North Central dummy variable, all regressors are nonsignificant in the nonrestricted equation. The test of restrictions indicates they are not applicable.

There are several factors that may explain why the own-price elasticity of the AFDC recipient rate has the wrong sign. One may be errors in measuring the number of poor persons. There are two potential sources of measurement error. First, the number of persons in poverty in each state was estimated. Second, the data from which the estimates were made are based on a sample.

Another reason may be that wrong structural relationships are assumed or the supply function is not perfectly elastic. These specification errors may also be responsible for the relatively poor results of the restricted AFDC benefit equation. In addition, previous work has shown that the determinants of public welfare expenditures change over time. Hence, there is the possibility of unknown variables becoming important determinants or supply curves shifting and becoming less than infinitely elastic. These types of changes can cause estimates to be biased.

There is some evidence for the existence of autocorrelation. For each state the first-order coefficient of autocorrelation is computed. The average values of these statistics are .48 for the restricted Medicaid equation, .44 for the restricted AFDC recipient rate equation, and .82 for the restricted AFDC benefit equation. The unrestricted counterparts are .65, .63, and .63, respectively. This informal test indicates there may be some loss of efficiency.

CHAPTER VI

SUMMARY AND CONCLUSIONS

The aim of this dissertation has been to estimate joint demand functions for the Medicaid and AFDC programs. Building upon previous research, a model was developed in which the median voter faces a series of shadow prices. Using the political process, the voter simultaneously makes known his demand for the Medicaid and AFDC recipient rates and for the AFDC benefit level.

Several conclusions can be made of each of the three demand equations estimated in this dissertation. The restricted recipient rate regressions have better fits than their unrestricted counterparts. On the other hand, removing the restrictions improves the fit of the AFDC benefit equation. For the Medicaid equation, removal of the equality restrictions leads to nonsignificant results in the unweighted regression. In the other Medicaid regressions the AFDC recipient rate has a negative although usually nonsignificant sign while the AFDC benefit level is always positive and significant at least at the ninety-five percent confidence level. The Medicaid benefit level consistently has a strong and negative sign, further supporting the view that the number of Medicaid recipients and benefit levels are inversely related. The signs of the proportion of persons in poverty, the two AFDC matching rates, urbanization, and the medical price index are sensitive to the weighting and the restrictions. Although Grannemann does not include the Medicaid matching rate as a separate variable, he does consider it to be a component of the price of recipients. Therefore, his model predicts a negative effect will be found. The empirical results show that the rate indeed has a negative sign and in two cases is highly significant. The number of physicians per capita, income, and percent black have positive coefficients in all three cases. As in many of Grannemann's regressions, education has a consistently negative sign.

In the AFDC recipient rate regression, the unweighted and unrestricted equation has the least reliable estimates. The AFDC benefit level has a strong and positive parameter value in all four regression equations. The model predicts a negative coefficient value. The Medicaid benefit level and state matching rate have negative and usually significant parameter values. The signs and significance levels of percent poor and the two AFDC matching rate variables depend on whether restrictions and/or weighting are used. Education is a weak predictor in all cases. The other four non-dichotomous and non-price variables tend to have positive and significant coefficients.

Unlike the recipient rate equations, the AFDC benefit equation's F ratio and R^2 are higher in the unrestricted regressions. The F tests for restrictions show the restrictions should not be applied. Except for the intercept, education, income, and temperature, all non-dichotomous variables are insignificant in the unweighted and unrestricted regression. Running the restricted regression using weighted data makes almost all variables become significant. The sign and significance of the AFDC recipient rate differs among equations. Orr uses a similar variable, the ratio of recipients to state population, which has a negative and significant impact on benefits in his regressions. The Medicaid benefit level, Medicaid matching rate, percent in poverty, income, and percent black have signs or t values that are sensitive to the weights and the restrictions. As in Orr's regressions, the marginal state share has a strong and negative effect on benefits demanded. The average state share parameter is negative and nonsignificant in the unweighted regressions and positive and significant in the weighted regressions. Education has a positive effect in all equations and urbanization and temperature usually have negative effects.

In conclusion, there is evidence that the demand for Medicaid recipients depends on the costs of the AFDC program and that the demands for AFDC benefits and recipients are functions of some of the costs of the Medicaid program. The results of the Medicaid regressions show that the AFDC benefit level and average share, which are components of the shadow price of the AFDC recipient rate, generally have significantly positive effects. Two of the variables making up the shadow price of AFDC benefits, the AFDC recipient rate and marginal share, usually have negative signs and in one equation they are significantly negative.

In every AFDC recipient rate equation regressed, the Medicaid benefits and matching rate have negative parameter values. In only one case is the Medicaid benefit level nonsignificant. Hence, the shadow price of the Medicaid recipient rate has an effect on the demand for the AFDC recipient rate. The marginal AFDC share, which makes up part of the AFDC benefits shadow price, has a negative influence in the restricted regressions and positive in the unrestricted runs. In the demand for AFDC benefits, the two Medicaid variables and the AFDC recipient rate have signs that are unstable among regressions. The sign of the average AFDC state share depends on whether the data is weighted although the marginal share always has a negative sign.

The results of this dissertation point to several avenues future research can take. There has been much criticism of the present matching rate formulas. In any discussion of reform, the cross-program effects of a change in matching rates should be taken into account. Second, the implications of alternate specifications of the median voter's utility function should be worked out. The effects of different functional forms of the demand fuctions should also be examined. In particular, why the AFDC benefit demand equation has a better fit when no restrictions are used should be explained. Another area for future study is extending the analysis to other government transfer programs.

APPENDIX A

DERIVATIONS OF AVERAGE TAXPAYER'S EXPENDITURES ON MEDICAID AND AFDC

The average taxpayer's tax liability equations are derived from the AFDC tax liability equation Orr uses in his article. His equation is reproduced below as equation (A-1).

$$(A\text{-}1)\quad T_i = n_i[B_i - B^F(B_i)]/STAX_i + n_iB^F(B_i)/USTAX + n^OB^F(B^O)/USTAX$$

In (A-1) T_i is taxpayer i's total liability, B is the total benefit per recipient, B^F is the portion of B (in dollars) which the federal government pays, n_i is the number of recipients in the state, B^O is the average total benefit in all other states, and n^O is the total number of recipients in all other states. Note that because of the federal matching provision the federal outlay per recipient depends on the total benefit per recipient. The first term on the right-hand side of (A-1) is the state tax burden of the taxpayer. The taxpayer also pays federal taxes, the proceeds of which go partly to his own state (represented by the second term) and partly to all other states (shown by the third term).

To derive equation (2) let m stand for Medicaid benefits and n represent the number of Medicaid recipients.

$$(A\text{-}2)\quad MEDTAX_i = n_i[m_i - m^F(m_i)]/STAX_i + n_i[m^F(m_i)]/USTAX$$

$$+ n^O[m^F(m^O)]/USTAX$$

Equation (A-3) results from factoring out m_i and m^O.

$$(A\text{-}3)\ MEDTAX_i = n_i m_i(1-g_i)/STAX_i + n_i m_i g_i/USTAX + n^O m^O g^O/USTAX$$

In (A-3) $g=m^F(m)/m$, or in words, g is the average federal matching rate. Since this rate is constant over all levels of benefits in the Medicaid program, it is equal to the marginal federal matching rate. By defining $G=1-g$ and letting $n=(n/P)P=aP$ equation (2) is arrived at.

A similar procedure is used to obtain the average AFDC tax burden. Using n_i to denote the number of AFDC recipients and b_i for the AFDC benefit per recipient,

$$(A\text{-}4)\ AFDCTAX_i = n_i[b_i-b^F(b_i)]/STAX_i + n_i[b^F(b_i)]/USTAX + n^O[b^F(b^O)]/USTAX$$

To get equation (A-5) the benefit levels are factored out and h(b) is defined as the average federal AFDC matching rate. Unlike the previous case, however, the average matching rate is a function of the benefit level.

$$(A\text{-}5)\ AFDCTAX_i = n_i b_i[1-h(b_i)]/STAX_i + n_i b_i[h(b_i)]/USTAX + n^O b^O[h(b^O)]/USTAX$$

By replacing 1-h(b) with H(b) and letting n=(n/P)P=wP equation (4) is obtained.

APPENDIX B

DERIVATION OF SHADOW PRICES

In deriving shadow prices (7a)-(7d), it is assumed that s^0, m^0, w^0, b^0, P^0, G^0, and $H(b^0)$ are all exogenous. The first-order conditions are as follows:

$$\text{(B-1)}\quad U_{is} = 1[m_iP_iG_i/STAX_i + m_iP_i(1-G_i)/USTAX]$$

$$\text{(B-2)}\quad U_{im} = 1[s_iP_iG_i/STAX_i + s_iP_i(1-G_i)/USTAX]$$

$$\text{(B-3)}\quad U_{iw} = 1[b_iP_iH(b_i)/STAX_i + b_iP_i[1-H(b_i)]/USTAX]$$

$$\text{(B-4)}\quad U_{ib} = 1[w_iP_iH(b_i)/STAX_i + b_iw_iP_iH'(b_i)/STAX_i + w_iP_i[1-H(b_i)]/USTAX + b_iw_iP_i[1-H'(b_i)]/USTAX]$$

The shadow prices are enclosed within the brackets. The second terms of the shadow prices in (B-1) through (B-3) and the last two terms of (B-4) can be dropped because they are numerically small.

Equation (B-4) can be further simplified by recalling that $H(b_i)$ is defined as $1-h_i$. In other words, $H(b_i)=b_i^S/b_i$ where b_i^S is the dollar amount of benefits the state pays out. Therefore,

$$\text{(B-5)}\quad H'(b_i) = [(db_i^S/db_i)b_i-b_i^S]/b_i^2 = [M_ib_i-b_i^S]/b_i^2$$

Substituting in the definitions of $H(b_i)$ and $H'(b_i)$ into (B-4) results in the shadow price (7-d).

APPENDIX C

DATA SOURCES

VARIABLE	SOURCE(S)
Medicaid Recipients	U.S. Department of Commerce, Bureau of the Census. Statistical Abstract of the United States. 1977-1979, 1981, 1982/83, 1984.
Medicaid Benefits	U.S. Department of Commerce, Bureau of the Census. Statistical Abstract of the United States. 1977-1979, 1981, 1982/83, 1984.
AFDC Recipients	U.S. Department of Health, Education and Welfare. Social Security Administration. Annual Statistical Supplement to the Social Security Bulletin. 1976-1982.
AFDC Benefits	U.S. Department of Health, Education and Welfare. Social Security Administration. Annual Statistical Supplement to the Social Security Bulletin. 1976-1982.
Population in Poverty	
population in poverty, 1975	U.S. Department of Commerce. Bureau of the Census. Current Population Reports. Series P-60, Nos. 110-113, "Spring 1976 Survey of Income and Education," 1978.
population in poverty, 1979	U.S. Department of Commerce. Bureau of the Census. 1980 Census of Population, Vol. 1, Characteristics of the Population, Chapter C, General Social and Economic Characteristics. table 72, 1983.
total U.S. population in poverty, 1976-1981	U.S. Department of Commerce. Bureau of the Census. Current Population Reports. Series P-60, No. 140, "Money Income and Poverty Status of Families and Persons in the United States: 1982," table 15, p. 21.

State Resident Population	U.S. Department of Commerce. Bureau of the Census. Statistical Abstract of the United States. table 11, 1978, 1984.
Medicaid Federal Share	U.S. Department of Health, Education and Welfare. Health Care Financing Administration. Data on the Medicaid Program. 1979 Edition (revised), table 19, p. 38.
AFDC Federal Share	U.S. Department of Health, Education and Welfare. Social Security Administration. Characteristics of State Plans for Aid to Families with Dependent Children. 1976-1979.
Median Years of Education	U.S. Department of Commerce. Bureau of the Census. 1980 Census of Population. Vol. 1, Characteristics of the Population. Chapter C, General Social and Economic Characteristics. table 66, 1983.
Personal Per Capita Income	U.S. Department of Commerce. Bureau of Economic Analysis. Survey of Current Business. April 1983, Vol. 63, No. 4, table 2, p. 36 and April 1979, Vol. 59, No. 4, table 1, p. 20.
Black Population	
--black population, 1976	U.S. Department of Commerce. Bureau of the Census. Current Population Reports. Series P-20, No. 334, "Demographic, Social and Economic Profile of the States: Spring 1976," table 1, p. 16, 1979.
black population, 1980	U.S. Department of Commerce. Bureau of the Census. 1980 Census of Population. Vol. 1, Characteristics of the Population. Chapter B, General Population Characteristics. table 15, 1982.
total U.S. black population, 1976-1981	U.S. Department of Commerce. Bureau of the Census. Current Population Reports. series P-25, No. 917, "Preliminary Estimates of the Population of the United States, by Age, Sex, and Race: 1970 to 1981," table 2, pp. 26-33, 1982.

Urbanization	U.S. Department of Commerce. Bureau of the Census. 1980 Census of Population. Vol. 1, Characteristics of the Population. Chapter A, Number of Inhabitants. table 1, 1982.
Physicians	U.S. Department of Commerce. Bureau of the Census. Statistical Abstract of the United States. 1978-1984.
Unemployment Rate	U.S. Department of Labor. Employment and Training Administration. Employment Report of the President. table D-4, p. 260, 1982.
Average January Temperature	U.S. Department of Commerce. Bureau of the Census. Statistical Abstract of the United States. table 373, p. 217, 1984.
SMSA Population	U.S. Department of Commerce. Bureau of the Census. Current Population Reports. Series P-25, No. 810, "Estimates of the Population of Counties and Metropolitan Areas: July 1, 1976 and 1977," 1979.
NE, NC, S	U.S. Department of Commerce. Bureau of the Census. State and Metropolitan Data Book 1982. page xi, 1982.
Medical Price Index	
state-wide index, 1975	Ira L. Burney, George J. Schieber, Martha O. Blaxall, and Jon R. Gabel. "Geographic Variation in Physicians' Fees: Payments to Physicians Under Medicare and Medicaid." Journal of the American Medical Association, vol. 240 (September 22, 1978) : 1370.
Medicare index, 1975	Ira L. Burney, George J. Schieber, Martha O. Blaxall, and Jon R. Gabel. "Geographic Variation in Physicians' Fees: Payments to Physicians Under Medicare and Medicaid." Journal of the American Medical Association, vol. 240 (September 22, 1978) : 1370.
medical component of CPI, 1975-1981	U.S. Department of Commerce. Bureau of the Census. Statistical Abstract of the United States. table 809, page 493, 1984.

General Price Index

state-wide CPI, 1972	Victor R. Fuchs, Robert T. Michael, and Sharon R. Scott. "A State Price Index." NBER Working Paper 320, Cambridge, Mass.: National Bureau of Economic Research, February 1979, table 1.
personal income in current dollars, 1975-1981	U.S. Department of Commerce. Bureau of the Census. Statistical Abstract of the United States. 1977-1979, 1981, 1984.
personal income in constant (1972) dollars, 1975-1981	U.S. Department of Commerce. Bureau of the Census. Statistical Abstract of the United States. 1977-1979, 1981, 1984.

BIBLIOGRAPHY

Albin, Peter S. and Stein, Bruno. "Determinants of Relief Policy at the Sub-Federal Level." Southern Economic Journal vol. 38 (April 1971) : 445-457.

Becker, Gary S. and Lewis, H. Gregg. "On the Interaction Between the Quantity and Quality of Children." Journal of Political Economy vol. 81 part 2 (March/April 1973) : S279-S288.

Ben-Zion, Uri and Spiegel, Uriel. "Philanthropic Motives and Contribution Policy." Public Choice vol. 40 (Spring 1983) : 117-133.

Bergstrom, Theodore C. and Goodman, Robert P. "Private Demands for Public Goods." American Economic Review vol. 63 (June 1973) : 280-296.

Berkanovic, Emil. "An Appraisal of Medicaid Records as a Data Source." Medical Care vol. 12 (July 1974) : 590-595.

Borcherding, Thomas E. and Deacon, Robert T. "The Demand for the Services of Non-Federal Governments." American Economic Review vol. 62 (December 1972) : 891-901.

Boadway, Robin W. Public Sector Economics.Cambridge, Mass.: Winthrop Publishers, 1979.

Burney, Ira L., Schieber, George J., Blaxall, Martha O. and Gabel, Jon R. "Geographic Variation in Physicians' Fees: Payments to Physicians Under Medicare and Medicaid." Journal of the American Medical Association vol. 240 (Sept. 22, 1978) : 1368-1371.

Collins, Lora S. "Public Assistance Expenditures in the United States" In Studies in the Economics of Income Maintenance. Edited by Otto Eckstein. Washington D.C.: The Brookings Institution, 1969.

Daly, George and Giertz, Fred. "Welfare Economics and Welfare Reform." American Economic Review vol. 62 (March 1972) : 131-138.

Davis, Karen and Schoen, Cathy. Health and the War on Poverty: A Ten-Year Appraisal.Washington D.C.: The Brookings Institute, 1978.

Dawson, Richard E. and Robinson, James A. "The Politics of Welfare" In Politics in the American States.Edited by Herbert Jacob and Kenneth N. Vines. Boston: Little, Brown and Company, 1965.

Fabricant, Solomon. The Trend in Government Activity in the United States Since 1900. New York: National Bureau of Economic Research, 1952.

Fisher, Glenn W. "Determinants of State and Local Government Expenditures: A Preliminary Analysis." National Tax Journal vol. 14 (December 1961) : 349-355.

Fisher, Glenn W. "Interstate Variation in State and Local Government Expenditures." National Tax Journal vol. 17 (March 1964) : 57-74.

Fuchs, Victor R., Michael, Robert T., and Scott, Sharon R. "A State Price Index," NBER Working Paper 320, Cambridge, Mass.: National Bureau of Economic Research, February 1979.

Giertz, J. Fred and Sullivan, Dennis H. "Donor Optimization and the Food Stamp Program." Public Choice vol. 29 no. 2 (1977) : 19-35.

Grannemann, Thomas W. "The Demand for Publicly Financed Medical Care: The Role of Interdependent Preferences," Evanston, Illinois: Northwestern University, August 1979.

Grannemann, Thomas W. "Reforming National Health Programs for the Poor" In National Health Insurance: What Now, What Later, What Never?. Edited by Mark V. Pauly. Washington D.C.: American Enterprise Institute for Public Policy Analysis, 1980.

Health Care Financing Administration. Health Financing Program Statistics. Washington D.C.: Health Care Financing Administration, 1980.

Hochman, Harold and Rogers, James D. "Pareto Optimal Redistribution." American Economic Review vol. 59 (September 1969) : 542-557.

Inman, Robert P. "Testing Political Economy's 'As If' Proposition: Is the Median Income Voter Really Decisive?." Public Choice vol. 33, no. 4 (1978) : 45-65.

Johnston, J. Econometric Methods. 2nd ed. New York: McGraw-Hill Book Company, 1972.

Leffler, Keith B. "Minimum Wages, Welfare, and Wealth Transfers to the Poor." Journal of Law and Economics vol. 21 (October 1978) : 345-358.

Lovell, Michael C. "Spending For Education: The Exercise of Public Choice." Review of Economics and Statistics vol. 60 (November 1978) : 487-495.

Maddala, G. S. Econometrics. New York: McGraw-Hill Book Company, 1977.

Mueller, Dennis C. Public Choice. Cambridge: Cambridge University Press, 1979.

Orr, Larry L. "Income Transfers as a Public Good: An Application to AFDC." American Economic Review vol. 66 (June 1976) : 359-370.

Rogers, James D. "Explaining Income Redistribution" In Redistribution Through Public Choice. Edited by H.M. Hochman and G.E. Peterson. New York: Columbia University Press, 1974.

Sacks, Seymore and Harris, Robert. "The Determinants of State and Local Government Expenditures and Intergovernmental Flow of Funds." National Tax Journal vol. 17 (March 1964) : 75-85.

Shall, Lawrence D. "Interdependent Utilities and Pareto Optimality." Quarterly Journal of Economics vol. 86 (February 1972) : 19-24.

Spall, Hugh. "Income Transfers as a Public Good: Comment." American Economic Review vol. 62 (February 1972) : 985-989.

Thurow, Lester D. "The Income Distribution as a Pure Public Good." Quarterly Journal of Economics vol. 85 (May 1971) : 327-336.