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ORGANIZATIONAL FAILURE AND INCENTIVE CONTRACTS
IN THE PUBLIC SECTOR: EVIDENCE FROM AN EXPERIMENT
IN THE FINANCING OF MENTAL HEALTH CARE

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ABSTRACT

This paper makes use of a unique "natural experiment" in the design of intergovernmental grants. The State of Ohio has dramatically altered the method by which local public mental health care is financed. The manner in which the grant mechanism has been altered allows for the estimation of income compensated subsidy responses of local governmental entities. The empirical results indicate strong responses to the "new" incentives suggesting a direction for policy makers for dealing with some of the most vexing problems in mental health policy.

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I. Introduction

Public economics has long been concerned with issues related to fiscal federalism (Stiglitz 1977). Central to that work has been the analysis of the impact of the form of intergovernmental transfers on the behavior of local government (Atkinson and Stiglitz 1980). Policies towards these transfers are growing in importance because public goods and services continue to be produced at the local level while they are increasingly financed by higher levels of government (Inman 1987a). The concentration of financing at one level and production of public goods and services at a different level creates a potential divergence of policy goals between funders and producers (Niskanen, 1971, 1975). This is directly analogous to the analysis of failures within private sector organizations studied in the literature on economic agency (Holmstrom and Tirole 1987), hence the terms of intergovernmental transfers can be viewed as incentive contracts.¹

The terms governing intergovernmental transfers represent a well known policy tool, available to funders (federal and state government), for aligning the goals of local governments with their own. In this paper we take advantage of a unique "natural experiment" in the State of Ohio to estimate the reactions of local government providers to the incentives contained in transfers from state government for provision of mental health services. Indeed, the exogenous policy changes in Ohio that comprise the experiment are structured in such a way that it is possible to observe "income compensated" responses to changes in subsidies.

¹ Budgeting limitations have been considered in this context by Courant and Rubinfeld (1981) and by Inman (1982). The problem we consider here concerns allocation of a fixed budget as opposed to the overall size of government.

Fiscal transfers between state and local government are of central importance in the mental health sector of the economy and involve significant portions of state government budgets. State governments must formulate policies in an environment where local providers of public mental health services have strong preferences over the types of clients they treat. These preferences tend not to coincide with the socially optimal production of public mental health, since providers' preferences for treating certain types of patients are not necessarily shared by the public. The State of Ohio has chosen to address this problem by altering the prices paid for particular types of patients and certain treatments. The empirical analysis in this paper contains results on the initial stages of the Ohio experiment. The paper is divided into 8 sections. The second section provides some institutional background on the mental health sector. The third section describes the Ohio experiment. The fourth section presents some relevant theoretical propositions that will guide the empirical analysis. The fifth section describes the empirical approach to obtaining estimates of the experimental impacts. The sixth section of the paper describes the data used in the analysis. Results are reported in the seventh section. Conclusions are discussed in the final section.

II. Mental Health Care

Mental illness is a major health problem in the United States. Approximately 18% of the population has a diagnosable mental illness in any year (Locke and Regier 1985). Six percent of the population will have a severe mental illness during their lifetime (National Institute of Mental Health, 1991). Individuals with severe mental illness are disproportionately

indigent and rely heavily on the public mental health system. Total expenditures on mental health care in 1985 were estimated to be \$32 billion (Rice *et al.*, 1990), which amounts to roughly 1% of national income.² Approximately 54% of all expenditures on mental health care are accounted for by the public sector. The majority of public expenditures are made by state mental health agencies (National Association of State Mental Health Program Directors, 1990).

State mental health agencies play two principal roles in the mental health system. First, they finance and operate state mental hospital systems. Currently, about \$10.5 billion is allocated to these facilities annually (National Association of State Mental Health Program Directors 1990). The second role of state mental health agencies is to finance community mental health services, delivered at the local level. This is primarily accomplished via intergovernmental transfers to local mental health agencies.

Since the 1960s there has been a dramatic reduction in the capacity of state mental hospitals. This phenomenon has been termed deinstitutionalization. The number of beds in these institutions has been reduced by approximately 75%. A corresponding shift in the site of treatment for mental illness has accompanied this change. Despite the sizeable decline in state mental hospital treatment capacity, the budget shares of state mental hospital systems have remained relatively constant at around 65% (National

²This is quite a bit higher than the percent of national income devoted to some industries traditionally studied by economists, e.g., in 1985 primary aluminum manufacturing accounted for 0.19% of national income, brewing was 0.39%, tobacco was 0.57% and shoes and slippers were 0.15%. It is comparable to expenditures on the criminal justice system, which were 1.23% of national income, and about equal 12% of expenditures on schools at all levels, which were 7.5% of national income. All data are from U.S. Bureau of the Census (1986).

Association of State Mental Health Program Directors, 1990). In addition, the most severely disabled patients are underrepresented in the population of patients treated in community mental health programs (U.S. General Accounting Office, 1977).³

Policy makers and clinicians generally agree that current allocations of resources to state mental hospital systems represent an imbalance (Mechanic, 1987). Among the elements contributing to the perceived imbalance in budget allocations for mental health care is the structure of financial incentives facing local mental health systems (Frank and Gaynor, 1991). The typical public mental health system is structured so that the local mental health authority may use the state hospital at no "on-budget" cost, but subject to a capacity constraint. There is generally excess demand for community treatment programs. Therefore, local programs are able to avoid the most severely disabled patients, who also tend to be the most costly to treat. This is accomplished, in part, by making use of the "free" services at the state mental hospital.

Efforts to alter the allocation of resources between community programs and state hospitals during the late 1970s and 1980s have generally failed. Use of further capacity constraints and administrative procedures have either been ineffective or politically costly (Frank and Welch, 1982; Brown, 1985). Recognizing the incentives embedded in current practices, state mental health agencies have become interested in using the terms under which intergovernmental transfers are made to influence the behavior of local mental

³ The underrepresentation of severely mentally disabled clients in community treatment programs has been linked to homelessness as well as to persistently high budget shares for state mental hospitals.

health agencies. Specifically, several state mental health agencies are trying to structure intergovernmental transfers to discourage the use of state mental hospitals and encourage treatment of the most severely ill patients in community programs.

III. The Ohio Experiment

In 1985 roughly 63% of mental health treatment program dollars in Ohio were spent on institutional care (Ohio Department of Mental Health, Annual Report, 1986).⁴ The remaining 37% of the treatment dollars were distributed among 53 local mental health boards. These boards are quasi-independent special districts with independent taxing authority.⁵ Prior to 1986 one could characterize the Ohio system of intergovernmental transfers as being akin to the typical case described above. During the mid-1980s the Ohio Department of Mental Health initiated a set of changes in the manner in which intergovernmental transfers to local mental health boards were made. The changes consisted of two key policies that are described in detail below.

A. The 508 Count Policy

The purpose of the 508 Count Policy is to provide a mechanism for allocating funds based on the number of severely mentally disabled persons served by the mental health systems governed by each local mental health

⁴ Institutional care includes care in state mental hospitals and mental health services provided in prisons.

⁵ The mental health boards may by statute levy a property tax. The amount of the levy is determined by a direct referendum in each county (or special district where boards include multiple counties). The mental health board consists of a group of individuals that are appointed by either the governor or the county commissioners.

board.⁶ Beginning in 1983 the Ohio Department of Mental Health (hereafter ODMH) issued regulations proposing a method for defining and counting the severely mentally disabled.⁷ The count of severely mentally disabled clients was initially used as an administrative tool for aiding ODMH staff in making allocation decisions based on a general consideration of local mental health care "needs". Between 1985 and 1987 the method of defining the severely mentally disabled continued to be refined.⁸ In 1985 and 1986 only a small portion of all dollars for programs treating the severely mentally disabled were affected by the 508 count because most of these funds were allocated according to a historical base plus an across the board increase. Since 1987 the method for classification of individuals has been finalized and an increasing level of funds have been allocated using the 508 count. We estimate that in 1990 approximately \$11 million of \$42 million allocated for the treatment of the severely mentally disabled were directly influenced by the 508 count.⁹

The 508 count policy therefore did not explicitly state a subsidy "price" to be paid per severely mentally disabled person in treatment. The

⁶ The mental health boards in Ohio do not provide any direct treatment. Instead they contract with individual providers of mental health and human services to supply needed care to clients of the public mental health system.

⁷ The criteria used for defining the severely mentally disabled involve specific standards for diagnosis, extent of disability, and the duration of illness.

⁸ The details of the 508 count policy are summarized in a ODMH memo from the Director of the ODMH, Martha Knisley. The memo is dated July 18, 1990 and is addressed to the Executive Directors of the Mental Health Boards.

⁹ The estimated allocation by SMD was made based on a review of a memo from Maureen Corcoran, Deputy Director ODMH, to the Executive Directors of the mental health boards in Ohio on the subject of "Allocation Guidelines-Fiscal Year 1990". This memo was dated July 14, 1989.

executive directors of the boards were only given the aggregate number of dollars that would be allocated according to the 508 count of severely mentally disabled persons in treatment. The allocation of budget dollars were based on the previous year's 508 count (although this is being changed in 1991). However, some retrospective reconciliation does occur.¹⁰ In sum the 508 policy is a prospectively paid "bonus" to boards based on their enrollment of individuals classified as severely mentally disabled i.e., a per capita subsidy.¹¹ There is therefore an incentive to enroll individuals but not necessarily to continue treatment. The amount of the bonus per severely mentally disabled person is unannounced and would be difficult for a board director to estimate.

B. The Mental Health Act of 1988

Under the provisions of the Ohio Mental Health Act of 1988 each board is given explicit financial responsibility for the use of state mental hospital care. This policy is being phased in over a 6 year period. In the fully phased-in policy each mental health board which elects to participate will receive a block grant equal to 100% of the average annual historical use of

¹⁰ This reconciliation involves adjustments based on the actual count as well as review of cases proposed by boards as meeting criteria for severe mental disability. On average 75% of identified cases are in the end certified (Ohio Department of Mental Health, 1990).

¹¹ Since the value of the bonus was not announced at the beginning of the period and depends on the ODMH budget the bonus scheme has features of a tournament.

the state mental hospital (Ohio Assembly Bill 156).¹² The mental health boards will have to pay the average cost of each day of care in a state mental hospital used by its clients.¹³

Clearly, paying average cost per day creates a strong financial incentive at the margin to reduce the use of state hospital services relative to the historical situation where the use of these services was "free" up to the capacity constraint.¹⁴

The phasing-in of the Mental Health Act calls for a block grant of 10% in the first year, 20% in the second year, 40% in the third, 60% in the fourth, 80% in the fifth and 100% thereafter. This means that, for example, in the first year of the policy (1990) each board received a block grant equal to 10% of its historical use and was "at risk" for all costs of state hospital care between 90% and 100% of its historical use. The initial block grants ranged from approximately \$100,000 for some of the smaller boards to

¹² Boards were given the opportunity to not participate in the new policy. A number of boards chose not to participate. This clearly raises the possibility of selection bias in the natural experiment. This issue is discussed in the section dealing with estimation strategies below.

¹³ Since there is considerable evidence that state hospitals produce subject to constant returns to scale, this is likely to be a reasonable approximation to marginal cost (Frank & Welch, 1982).

¹⁴ The Mental Health Act also includes provisions for a "risk" fund for the boards. For costs between 100% and 105% of historical use of state hospital care there is 50% cost sharing between the board and the risk fund. Where costs incurred are between 106% and 110% of historical levels the boards pay 25% of the costs. Costs between 111% and 115% are fully covered by the risk fund and expenses above 115% are borne fully by the board. Based on interviews with ODMH staff and the executive directors of several mental health boards the only rationale for the risk fund arrangements was related to making the Mental Health Act politically acceptable to interested parties. It should also be noted that only one LMHBs made use of the risk fund in the first two years. Thus, taking this aspect of the "budget" constraint into account in estimation would depend entirely on the functional form assumed.

approximately \$3 million for large boards such as Cleveland. The natural experiment represented by the Mental Health Act of 1988 therefore allows one to estimate the "income compensated" response to the elimination of the subsidy for state mental hospital care. Since the block grant compensates boards for the expense of their historical usage, the charge for state hospital usage is an income-compensated price. The effect on utilization will be the income-compensated price effect.¹⁵

IV. Theory

The 508 Count Policy constitutes a specific subsidy aimed at community treatment of severely mentally disabled individuals, whereas the Mental Health Act substitutes a block grant for the subsidy on use of state mental hospitals. Together these can be thought of as constituting the state's incentive contract for the bureaucracies of the local mental health boards. Our goal in this paper is to estimate the reactions of the LMHB's to the incentives in the terms of the intergovernmental transfers. The LMHB's supply and demand responses to state policies are crucial datum in determining optimal policy (Frank and Gaynor 1991).

The interaction between state government and the LMHB can be characterized as a von Stackelberg game in leader and the LMHB the follower. State government moves first in setting "prices", (i.e., per unit subsidies or taxes for each of the services chosen by the LMHB) given the LMHB's reaction functions, and then the LMHB chooses the level and mix of treatments, given prices. The optimal "prices" are the prices for treating various clients in

¹⁵ This is not exactly equal to the substitution effect, since it is not utility compensated, but we speculate that it should be close.

the community and in state hospitals which maximize social welfare, constrained by the combination of treatments that the LMHB will choose under a balanced budget.

Since our goal is to estimate the reaction functions of the LMHB, we describe only "half of the game," the behavior of the LMHB. In what follows we briefly summarize the model of LMHB behavior and discuss its implications for the empirical analysis.¹⁶

The LMHB is assumed to determine the quantities and types of treatments received by patients.¹⁷ Treatment options consist of care in the community or care in the state mental hospital system. The LMHB receives utility from the mental health of residents in the locality but has preferences over the types of patients treated. Studies of community mental health services indicate that LMHBs incur disutility from the number of "difficult" patients treated (U.S. General Accounting Office, 1977; Brown, 1985).

We capture this aspect of LMHB preferences by identifying two main types of patients that receive mental health services, indexed by $i=1,2$. "Less desirable" patients are referred to as type 1's, and type 2's are called "more desirable" patients. For example, type 1's may be non-compliant and difficult to treat individuals with severe mental illnesses, whereas type 2's may be cooperative and less severely ill. Type 1's have poor prognoses, are less pleasant, and may be more costly to treat.

The LMHB therefore maximizes a preference function which depends positively on the mental health of a representative mentally ill local

¹⁶ See Frank and Gaynor (1991) for an analysis of the complete game between the state and the LMHB and optimal incentives.

¹⁷ This assumption abstracts from contracting problems at the local level. The focus here is on the "incentive contract" between state government and the LMHB. We also assume excess demand for treatments.

resident of each patient type, H_1 , and negatively on the number of treatments to a representative type 1.¹⁸ We specify the utility function as the weighted sum of social welfare (from mental health status) and private benefits to the LMHB related to the types of patients that are most rewarding to treat (the weights are implicit in u and v).¹⁹

$$U = u(H_1, H_2) + v(Q_1), \quad (1)$$

where u is monotonically increasing in H_1 and H_2 , v is monotonically

¹⁸ This is a representation which is intended to convey the disutility associated with treating difficult patients. Other representations may include treating the percentage of the case load as determining the level of disutility. There is extensive clinical evidence indicating that there is a segment of the mentally ill population which is substantially more difficult to treat, namely the severely mentally ill (Bachrach, 1982).

¹⁹ This is essentially the same functional form as that applied by Shapiro and Willig (1990) to study issues of public versus private provision. This can be viewed as reflecting the discretion of local government institutions to pursue agendas other than social welfare. A good deal of work has been done on the conditions under which discretion is possible, stimulated to a large extent by the so-called "flypaper effect". One approach models the outcome as determined by bargaining between interested parties, e.g., bureaucrats and politicians, so that the outcome places some weight on the preferences of public employees. Inman (1987b) and Rubinfeld (1987) summarize several such models. An alternative proposition is that in the presence of non-matching grants voters are subject to "fiscal illusion", i.e., they do not correctly perceive the marginal tax price of public services.

decreasing in Q_1 , and u and v are strictly quasi-concave.^{20,21}

The production of community and state hospital treatments are assumed to display constant returns to scale. We further assume that the LMHB is constrained to incur costs (C) equal to its budget. These assumptions allows us to specify a linear budget constraint. This constraint is specified to include state policies regarding subsidization (taxation) (S_i) of specific services,

$$(2) B = (C_1 + S_1) Q_1 + (C_2 + S_2) Q_2 + (C_3 + S_3) A_1 + (C_4 + S_4) A_2,$$

where the S 's and C 's are the per unit subsidies (or taxes) and costs respectively.²² Thus, the $(C + S)$ s are the "prices" or net subsidies for the treatments. The analysis is now analogous to that of subsidies and taxes in the theory of the consumer. Increases in the subsidy of a treatment will increase the amount chosen, and vice versa. Cross-price effects depend on substitution or complementarity in consumption.

²⁰ Any other arguments in the utility function, such as a composite public commodity (e.g., expenditures on all other local goods or services) have been omitted. This is because we wish to focus on the choice of treatment in the community or in the state mental hospital, not on the tradeoff between public provision of mental health services and other goods. This amounts to the assumption that utility is strongly separable in mental health services and other goods. This assumption is prima facie validated by the existence of special districts for mental health care.

²¹ The mental health of each representative mentally ill resident of type i is produced with community treatments received by them, Q_i , and treatments in the state mental hospital received by them, A_i , according to a monotonically increasing and quasi-concave health production function $H_i = h_i(Q_i, A_i), i=1,2$.

²² Note that S 's are negative for subsidies and positive for taxes.

The LMHB's optimizing choices of the Q_i 's and A_i 's are determined by the first order conditions to the LMHB's utility maximization problem.²³ These jointly define the LMHB's optimal choices of community and state hospital treatments for both types of patients as functions of per-unit costs, the subsidies/taxes, and the LMHB's budget,

$$Q_i = q_i (B, C_1, C_2, C_3, C_4, S_1, S_2, S_3, S_4), \quad i = 1, 2 \quad (5)$$

and

$$A_i = a_i (B, C_1, C_2, C_3, C_4, S_1, S_2, S_3, S_4), \quad i = 1, 2. \quad (6)$$

Equation (5) can be viewed as a supply function of the LMHB.²⁴ Equation (6) is the demand function for state hospital services. The empirical analysis estimates the parameters of these functions.

Specifically, the Ohio plan serves to alter the values of B , S_1 , S_3 and S_4 . That is, the 508 policy changes S_1 from a value of zero to a positive subsidy per type 1 (severely mentally disabled) patient enrolled. The Mental Health Act of 1988 phases in a change in the values of $C_3 + S_3$ and $C_4 + S_4$ from zero to marginal cost. The Mental Health Act of 1988 also changed B by the amount of each LMHB's historical use of the state hospital valued at current prices (long run marginal cost). This aspect of the structure of the experiment allows us to estimate the "income compensated" response to changes in S_3 and S_4 . Thus, we expect the declines (in absolute value) in S_3 and S_4 to result in reduced levels of state hospital use. Recall that the provisions of

²³ The FOC are omitted for the purpose of brevity.

²⁴ For a full derivation, see Frank and Gaynor (1991).

the Mental Health Act of 1988 are being phased-in overtime and that we only observe the initial two years of that experience. We hypothesize that the second year of the policy will have a stronger impact on the level of 'A' than the first because the LMHB has a larger "risk" in the second year. In other words the "effective price" increases as the policy is phased-in. The response to the increase (in absolute value) in S_1 is expected to be positive (unless Q_1 is a Giffen good). The cross-subsidy responses cannot be signed a priori.

V. Econometric Model

The policy changes in Ohio provide a natural experiment for studying local government bureau responses to incentives contained in the terms of intergovernmental transfers. The change represented by the 508 Policy is a so-called pre-test post-test experiment. The first year of data for all boards, 1986, provides the pre-test observation, while the post-test consists of observations for all boards during the 1987-1990 time period.²⁵ The implementation of the Mental Health Act of 1988 is the second component of the experiment. The observations on all boards for the period prior to 1990 represent the pre-test. The observations for all boards electing to participate in the Mental Health Act policy in 1990 and 1991 form the post-test observations.²⁶ Boards not electing to participate in 1990 and 1991 form

²⁵ Data on the 508 count will not be available until well into the calendar year 1992.

²⁶ Boards make their participation decision each year. It is our impression from interviews of both board directors and state government staff that it would be more difficult for larger boards to "opt out" of the policy in any given year.

comparison groups. Since the two components of the Ohio experiment represent dramatic departures from past incentives in intergovernmental transfers, we expect that the impact will be observable simply by making direct comparisons between the "experimental" and "control" observations.

There are, however, important reasons to examine the data further using econometric methods. The fact that some LMHBs are permitted to choose whether or not to participate in the Mental Health Act component of the experiment on a yearly basis raises the potential problem of selection bias. A second issue is that the state's policy decisions over subsidies/taxes to the LMHB are determined as the equilibrium to a two-stage game played between the LMHB and the state. The state chooses its policies based in part on the LMHB's reaction functions, hence the possible endogeneity of the policy variables in the LMHB supply and demand functions. Finally, the federal government along with several mental health interest groups have been advocating for policies that make community care of the severely mentally ill a policy priority. National trends suggest that this advocacy is having some impact, thus any increases in the number of severely mentally ill individuals treated in the community over time may be due in part to this general trend.

Thus, in addition to the simple experimental comparisons, we estimated the LMHB response functions (5) and (6) for total days in the state mental hospital and the number of severely mentally disabled enrolled for treatment. These represent the theoretical variables $(A_1 + A_2)$ and Q_1 , respectively.²⁷

²⁷ We only measure one dimension of Q_1 . That is, Q_1 is the product of the number of type 1 patients times the number of treatments they receive. We measure only the number of patients. Data on number of treatments are not available for the time periods studied at the board level.

The primary threat to consistent estimation of the "experimental" effects concerns possible correlations between the policy variables and omitted characteristics of the LMHB's which are contained in the error term. These correlations may be due to self-selection, endogenous policy choices, or secular trends, as stated previously. Each of these problems can be considered to be related to unobserved heterogeneity. For the case of the 508 policy, where LMHBs were compelled to participate in the policy initiative, the first two problems can be corrected by the use of fixed effects estimation, assuming that the omitted LMHB specific effects are time invariant (Heckman and Hotz 1989). The secular trend is accounted for by including a linear time trend. In addition, the budget of the LMHB may be endogenous, both because LMHB's possess taxing authority and because the state chooses the LMHB's budget. We therefore employed as instruments variables known to enter the state's calculation of the LMHB's budget, e.g., population, age, and income. Income and population may also be related to the local contributions to the LMHB budget.

The problem of unobserved heterogeneity is more complicated, in the case of the Mental Health Act of 1988, because there is reason to believe that the unobserved heterogeneity varies over time. The number of LMHBs opting to participate in the Mental Health Act of 1988 policy changed between 1990 and 1991. Several LMHBs which exempted themselves in the first year decided to participate in the second year. One LMHB that participated in 1990 withdrew in 1991. Our general approach to accounting for the unobserved heterogeneity

was to adopt the least restrictive method to modeling its form.²⁸ Specifically, we allowed each LMHB fixed effect to interact with a quadratic time trend.²⁹ Relying on a flexible functional form and fixed effects to characterize the unobserved heterogeneity imposes relatively few restrictions on its form (Cornwell, Schmidt and Sickles 1990).

We were also concerned about the possibility of heteroskedasticity, especially since the areas served by the various LMHB's vary greatly in population. The Lagrange multiplier test of Breusch and Pagan (1980) was employed to test for heteroskedasticity. Since equations (5) and (6) are reduced forms, theory provides no guide to the specification of functional form. We therefore estimated four non-nested functional forms: linear in the dependent variable, logarithmic, square-root, and 2/3rd's power. Although there was little apparent difference between them, the linear and 2/3rd's power functions are reported in this paper.³⁰ Last, since there are efficiency gains from using random, as opposed to fixed, effects estimation we employed Hausman's (1978) test for the consistency of random effects.

²⁸ We did not adopt a Heckman (1979) approach to selection bias because of an inability to identify the model via exclusion restrictions and the fragility of estimates which rely on functional form for identification.

²⁹ This issue is akin to the problem of unobserved heterogeneity in the frontier production function literature. The alternative in both cases is making a parametric assumption about the distribution of the unobserved heterogeneity (e.g. half normal in the frontier literature).

³⁰ All other results are available from the authors upon request.

VI. Data

The unit of analysis in the empirical work is the individual mental health board. There are 53 such boards in the state of Ohio. These boards are special districts that consist of one or more counties, each with a population of at least 50,000. The great majority of boards are single county special districts. Data were obtained for each board for each year during the 1986-1991 period. Thus the data set consists of 316 observations on 53 boards for 6 years.³¹

A. Measurement of Dependent Variables

We focus on two key outcome measures of the policy changes: the number of state mental hospital days per 100,000 population for the residents of each mental health board area and the number of severely mentally disabled clients in treatment per 100,000 population within each board area. Data on this variable was only available for the years 1986-1990. The number of severely mentally disabled individuals is defined as those individuals meeting the 508 certification criteria in each board area. These data were obtained from the Ohio Department of Mental Health.³² These two variables are the direct objects of the policy experiment being studied.

³¹ Missing data resulted in the loss of two observations.

³² We are grateful to Rick Tully of the Ohio Department of Mental Health for his assistance in obtaining these data elements and a number of the others used in this analysis.

B. Measurement of Experimental Variables

There are two measures of the elements of the incentive contract: the 508 count policy and the Mental Health Act of 1988. The 508 count policy is measured as a simple dummy variable (YES508) that takes on a value of 1 in 1987 and the subsequent years and zero in 1986. While a 508 policy was in place in 1986 it did not assume its current form until 1987. Moreover, the funds allocated under the 508 program were considerably higher after 1986. The Mental Health Act is measured as two dummy variables (MHACT1) and (MHACT2). MHACT1 takes on a value of 1 in 1990 (the first year of the policy) and is equal to zero in all other years. MHACT2 is equal to 1 in 1991 (the second year of the policy) and is equal to zero in all other years.

During much of the time period being studied three boards received grants from the Robert Wood Johnson Foundation to reorganize their mental health systems in order to better serve individuals with severe mental illness. The Hamilton County, Franklin County and Lucas County mental health boards each received foundation grants. We account for this activity by specification of a dummy variable (RWJ) which is equal to one for these three boards in 1987-1991 and zero in 1986.

C. Other Covariates

A number of other variables are included in the model to instrument for the LMHB's budget and to account for differences in supply conditions in the market. The variables employed as instruments for a board's budget are population, age, and income. These are also often considered risk factors for mental illness. The total population of a board is constructed from county data. County population data are aggregated in multi-county board areas. These

data were obtained primarily from the State of Ohio (Ohio County User's System Report). Median age of the board population was directly based on Ohio county data for single county boards. In the case of multi-county boards median age was aggregated according to the percentage of total board population accounted for by each county.

Median household income in each county was obtained from Sales and Marketing Management Inc. for the years 1986-1989. For 1990 and 1991 we projected median income based on the average per annum growth during the 1986 to 1989 period for each county. The income data were deflated using the all-items portion of the CPI. For multi-county boards the aggregation method used was the same as for the median age variable.

We measure the average weekly health services wage in each county to account for differences in supply conditions. These data were obtained from the Ohio Data Users Center. The wage data for 1991 were not available at the time of the analysis. We therefore projected the wage rate in each county by adding the average per annum change in wages for each county to the 1990 wage for that county. These data were deflated using the all-items portion of the CPI. Finally, we include a variable which measures the number of state mental hospital beds available in each region of the state. The ODMH divides the state into regions for the purpose of assigning responsibility for state hospital services. We use these regions to calculate the number of beds available in each board's region. Because the ODMH's data on hospital beds was incomplete we contacted each hospital to verify its bed count for 1990 and 1991.

VII. Results

A. Descriptive Results

Table 2 reports trends in the mean value of the two main outcome variables of interest: the state mental hospital days per 100,000 population (RESPER) and the number of severely mentally disabled individuals enrolled in treatment programs per 100,000 population (SMDPER). In addition, the Table also reports the yearly average values for RESPER for those LMHBs that opted to become subject to the provisions of the Mental Health Act of 1988 in 1990 and those that opted out. The first two rows of Table 2 indicate that prior to 1990 there were rather modest declines in RESPER, between 0 and 3%. From 1989 to 1990, the first year of the Mental Health Act of 1988, there was a 15.6% decline in RESPER. The second year had a 14.8% fall in RESPER. This is consistent with a large "substitution" effect of charging LMHBs a non-zero price for state hospital use. Rows 3-6 of Table 2 disaggregate the time series of RESPER by whether or not an LMHB chose to participate in the provisions of the Mental Health Act of 1988. The values reported for the years 1986 to 1990 reflect the mean values of RESPER for the LMHBs that selected "in" or "out" of the policy in 1990. Because there was switching among the "experimental" and "control" groups between 1990 and 1991, the 1991 mean values were calculated using different sets of LMHBs than in the years 1986-1990.³³

Inspection of the disaggregated trends shows that the analysis of the overall trend data for RESPER may be misleading. The trend for the LMHBs

³³ Specifically 6 LMHBs joined the experimental group and one LMHB left the experimental group and joined the control group. The brackets indicate the lack of comparability.

which selected not to participate in the Mental Health Act of 1988 shows a 10.5% decline in RESPER between 1989 and 1990. Those selecting "in" had a decline of 17.5% during the same period. Thus, there remains evidence of a reduction in RESPER attributable to the incentives associated with the Mental Health Act. The magnitude of the effect is, however, considerably smaller than what one might infer from comparing the aggregate data for 1989 and 1990. These results underscore the need to adopt an estimation approach to take account of time varying selection. The seventh and eighth rows of Table 2 pertain to the SMDPER variable. The results show large increases in SMDPER during the 1987-1988 and the 1988-1989 time periods. The increases were 19.4% and 16.8% respectively. These two time periods represent the initial years of implementation of a direct link between budget allocations and the number of severely mentally disabled clients in treatment (the 508 Policy). The small increase in between 1989 and 1990 (1.1%) may reflect the fact that most severely mentally disabled clients were brought into treatment during the early years of the policy.

B. Econometric Estimates of Experimental Impacts

The results of the regressions for state hospital days (RESPER) are reported in Table 3, and those for enrollment of the severely mentally disabled (SMDPER) are contained in Table 4. Both Tables report fixed effects estimates because the Hausman test results reject the consistency of the variance components estimator. As mentioned above, the estimates reported on Table 3 are based on a time varying fixed effects model. Homoskedasticity was rejected by the Breusch-Pagan (1980) test, therefore the t-statistics are calculated using White's (1980) robust estimation procedure.

We first discuss the results for state hospital use contained in Table 3. The estimates for the impact of the 508 Policy on the use of state hospitals (RESPER) are positive but not significant at conventional levels. The coefficient estimates are sufficiently precise to note their implication. The positive sign of the estimated coefficients suggest that the subsidy paid for increasing enrollment of severely mentally disabled clients may result in increased demand for state hospital care. The estimates for MHACT1 are strongly negative and are significantly different from zero in all specifications. The magnitude of the estimated effect can most easily be seen by examination of the linear specification and comparing the MHACT1 coefficient to the 1989 level of RESPER. The estimated reduction in RESPER attributable to the Mental Health Act of 1988 in the first year of the phase-in is 8.7% . The estimates for MHACT2, which measures the second year of the phase-in of the Mental Health Act of 1988, also indicate a negative and statistically significant impact of the policy on use of state hospital days per 100,000 population. The coefficient from the linear specification suggests that the second year of the Act which involved 20% of the historical use of state hospital services, resulted in an additional 9.8% reduction in RESPER from 1989 levels. While the magnitude of the estimated impact of MHACT2 is greater than that of MHACT1, as hypothesized, the difference is not significant at conventional levels. In combination the results indicate a substantial reduction in state hospital use attributable to the provisions of the Mental Health Act of 1988. This represents the income compensated demand response to a subsidy reduction, and indicates that LMHBs are quite responsive to the incentives incorporated into intergovernmental transfers.

It is worth noting that the estimates for the dummy variable identifying

the three mental health boards that were demonstration sites for the Robert Wood Johnson Foundation's Program for the Chronically Mentally Ill is positive but very imprecisely estimated. These three boards were given additional funding to help restructure their mental health systems in order to better serve the chronically mentally ill in the community. The results suggest no independent impact of that program in terms of reducing use of state mental hospitals.

Table 4 reports the results for the number of severely mentally disabled enrolled by the boards. The estimated coefficients for the YES508 variable are consistently positive and significant. The explicit linking of budget dollars to the number of severely mentally disabled clients appears to have promoted the desired supply response. The results for the YES508 variable for the linear specification indicates that the Policy resulted in a 13% increase in the number of severely mentally disabled clients per 100,000 population in treatment during the 1987 to 1990 period. The size of the response is somewhat surprising given the substantial amount of uncertainty regarding the size of the subsidy that would be paid to the boards per severely disabled client.

The results for the MHACT variable reported in Table 4 suggests that altering the subsidy for state mental hospital services results in no significant increases in community treatment of the types of clients typically found in state mental hospitals (those who are severely disabled).³⁴

³⁴ We would expect that at later stages of the Ohio experiment when the mental health boards are responsible for 40%, 60%, 80% and 100% of their historical use that this effect might become positive and more precisely estimated.

C. Other Results

Most of the other factors included in both sets of regressions were not estimated to have significant impacts on either of the two outcome variables. The coefficient for the BEDS variable in the RESPER regressions was consistently negative but not significant. The magnitude of the coefficient was also quite small. This suggests a weak effect of capacity constraints on state hospital use. The BEDS variable was estimated to have no significant effect in the SMDPER regressions.

The linear time trend was consistently positive and significant in the RESPER regressions, the interpretation of this coefficient is, however, complicated by quadratic time trend's interaction with the fixed effects. The time trend was positive and significant for all specifications of the SMDPER regressions.

VIII. Conclusions

Intergovernmental transfers are potentially important tools for aligning the goals of higher levels of government, which finance public services, with local governments which produce public services. This mechanism has only recently been viewed as a policy instrument by the public mental health care system. The mental health system provides a fertile laboratory for studying the incentive effects of intergovernment transfer policies because these transfers represent a substantial portion of local public mental health funding and there is expanding policy interest in experimenting with those policies. The State of Ohio has made major changes in its approach to financing local mental health services. The specific approach adopted in Ohio allowed us to estimate "income compensated" responses of public mental

hospital utilization to removal of subsidies for those services and gross responses to creation of subsidies for community treatment of severely mental disabled individuals. The implications of the results for policy design are significant. Most obvious is the strong impact on LMHB behavior of a small change in incentives regarding use of state mental hospitals. The experimental observations (1990 and 1991) involved placing LMHBs at financial "risk" for only 10% and 20% of their historical use of the state mental hospital. The strong response indicates that eliminating the historical subsidy for use of state mental hospital services is a very effective approach to reducing use of those services. Given the difficulties with attempting to either "administer" reduced levels of hospital use or to impose new capacity constraints, altered subsidy arrangements appear to be a promising avenue for mental health policy.³⁵ We expect to observe continued reductions in the use of state mental hospitals in Ohio as the phase-in of the Mental Health Act continues.

The strong results for the 508 Policy address one of the most vexing problems encountered in mental health policy during the past 20 years. Neither general purpose grants for community mental health care, nor administrative directives, nor jaw-boning have succeeded in enrolling significant portions of individuals with severe mental disabilities. The 508 Policy has produced a clear increase in enrollment of severely mentally disabled individuals. This is rather impressive given the "noisy" price signal. However, the level of treatment for the severely mentally disabled remains unknown. The incentive

³⁵ Stein (1989) and Stein and Ganser (1983) have made a similar point based on casual observations from the state of Wisconsin.

structure encourages enrollment but does not reward the volume of care.³⁶ Further work is needed on the volume of treatment received by severely mentally disabled individuals in order to make more complete judgments about the impacts of the policy.

Our earlier paper (Frank and Gaynor 1991) showed that efficient levels of taxes and subsidies for public mental health services are proportional to the subsidy and tax supply elasticities of each service. This paper represents an initial attempt to provide empirical estimates of those supply responses. As mentioned above, we believe the experimental situation in Ohio is especially useful for this purpose because the state mental hospital subsidy responses are "income compensated". We expect that this evidence will be informative to state mental health agencies contemplating making similar changes to their intergovernmental transfer arrangements.

Finally, the results generally suggest that intergovernmental transfers can be powerful tools for influencing the behavior of local providers of public services. There are a wide range of other public services where local governments are responsible for providing services that are in large part financed by higher levels of government. Schools, services for the developmentally disabled, substance abuse services and child welfare programs are clear examples of locally provided services that rely heavily on transfers from state government. The significance of intergovernment transfer incentives in these sectors is likely to be large and like to grow in importance in the future. Thus the types of lessons learned in the mental health sector may have a broad set of applications in public economics.

³⁶ In this sense the incentives are similar to those found in a any prospective payment system where initiation of treatment is rewarded but not extent (or duration) of care. Ellis and McGuire (1986) and Shleifer (1985) discuss related incentive arrangements.

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TABLE 1
Variable Definitions and Descriptive Statistics

Variable	Definition	Mean (Standard Deviation)
SMDPER	Severely mentally disabled clients in community treatment per 100,000 population	276.21 (93.42)
RESPER	State mental hospital days of care per 100,000 population	9331 (6590)
YES508	Value of 1 for all boards beginning 1987; zero otherwise	0.67 (0.47)
MHACT1	Value of 1 for all boards participating in the Mental Health Act in 1990; zero otherwise	0.12 (0.33)
MHACT 2	Value of 1 for all boards participating in Mental Health Act in 1991; zero otherwise	0.13 (0.34)
Age	Mean age of board population	32.89 (1.51)
DINCOME	Deflated median household income	22,489 (3,649)
DWAGE	Deflated weekly health sector wages	314.35 (62.39)
RWJ	Value of 1 for 3 demonstration board beginning in 1987; zero otherwise	0.05 (0.21)
POP	Board population	204,180 (250,515)
BEDS	State mental hospital beds in region	68.95 (87.89)

TABLE 2
Trends in RESPER and SMDPER

	1986	1987	1988	1989	1990	1991
RESPER	10236	10213	10143	9841	8308	7078
% change		-0.2	-0.6	-3.0	-15.6	-14.8
RESPER(In)	10983	10805	10360	9941	8203	[7423]
% change		-1.6	-4.1	-4.1	-17.5	-
RESPER(Out)	8341	8712	9592	9588	8573	[5876]
% change		+4.7	+10.1	-0.0	-10.5	-
SMDPER	228.73	229.68	274.30	320.44	323.83	
% change		+0.4	+19.4	+16.8	+1.1	-

TABLE 3
State Mental Hospital Inpatient Days Regressions^{a,b}

<u>Independent Variables</u>	<u>Dependent Variable</u>	
	<u>RESPER^{2/3}</u>	<u>RESPER</u>
YES508	20.87 (1.66)	802.80 (1.89)
Age	-1.04 (0.29)	-68.52 (0.58)
DINCOME	0.006 (1.52)	0.21 (1.72)
DWAGE	0.16 (0.77)	4.66 (0.75)
RWJ	9.86 (0.47)	447.41 (0.55)
MHACT1	-29.51 (4.67)	-859.79 (4.26)
MHACT2	-35.41 (2.96)	-967.53 (2.52)
POP	-0.0007 (2.62)	-0.02 (2.45)
BEDS	-0.15 (0.81)	-5.31 (0.83)
TIME	9.01 (3.19)	244.72 (3.02)
Number of Observations	316	316

^aTime varying fixed effects (quadratic time trend). The estimates of the individual effects are not reported.

^b Estimates of standard errors are corrected using White's procedure. Robust t-statistics are in parentheses.

TABLE 4

Number of Severely Mentally Disabled Enrolled Regressions^{a,b}

<u>Independent Variables</u>	<u>Dependent Variable</u>	
	<u>SMDPER^{2/3}</u>	<u>SMDPER</u>
YES508	3.54 (2.21)	35.23 (2.18)
Age	0.38 (0.78)	4.93 (1.00)
DINCOME	-0.2x10 ⁻³ (0.65)	0.004 (0.86)
DWAGE	-0.01 (0.25)	0.07 (0.14)
RWJ	-5.12 (2.69)	-49.89 (2.52)
MHACT	-0.60 (0.47)	-8.39 (0.63)
POP	-0.1x10 ⁻⁴ (0.33)	-0.4x10 ⁻³ (0.72)
BEDS	0.01 (0.46)	0.05 (0.22)
TIME	2.06 (3.02)	19.12 (2.65)
Number of Observations	261	261

^a Fixed effects estimates. The estimates for the individual LMHB effects are not reported.

^b Estimates of standard errors are corrected for heteroskedasticity using White's procedure. Robust t-statistics are in parentheses below the parameter estimates.