Iowa State University
Digital Repository

Retrospective Theses and Dissertations

Iowa State University Capstones, Theses and Dissertations

1996

Rural and urban fiscal patterns

Maria Alicia Failde
Iowa State University

Follow this and additional works at: https://lib.dr.iastate.edu/rtd

Part of the Agricultural and Resource Economics Commons, Agricultural Economics Commons, and the Economics Commons

Recommended Citation

Failde, Maria Alicia, "Rural and urban fiscal patterns" (1996). *Retrospective Theses and Dissertations*. 16634.
https://lib.dr.iastate.edu/rtd/16634

This Thesis is brought to you for free and open access by the Iowa State University Capstones, Theses and Dissertations at Iowa State University Digital Repository. It has been accepted for inclusion in Retrospective Theses and Dissertations by an authorized administrator of Iowa State University Digital Repository. For more information, please contact digirep@iastate.edu.

المنارة للاستشارات

www.manaraa.com

86

Rural and urban fiscal patterns

ISU
1996
F35
c. 3

by

Maria Alicia Failde

A thesis submitted to the graduate faculty
in partial fulfillment of the requirements for the degree of
MASTER OF SCIENCE

Major: Agricultural Economics
Major Professor: Maureen Kilkenny

Iowa State University
Ames, Iowa
1996

Graduate College
Iowa State University

This is to certify that the Master's thesis of
Maria Alicia Failde
has met the thesis requirements of Iowa State University

Signatures have been redacted for privacy

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

INTRODUCTION

This is a comparative study of the fiscal patterns of rural and urban counties. The research is part of a larger project "Rural Development Implications of Employment Location" which concerns the interdependencies between regional employment, local government fiscal choices, public service delivery, commuting and/or migration, and structural changes in the regional economy.

The empirical analysis of taxes and public spending by type of agent (farm, business, household) and by county provides the kind of information individuals consider when they vote, or when they "vote with their feet" (relocate). It is often assumed that citizens are aware of the variations in tax burdens and benefits of different agents and in different places. This is highly unlikely, because no single government agency provides a comprehensive account of the complex vertical (local, state, and federal), much less horizontal (school district, municipality, county, state) fiscal flows of taxes and government spending. Each jurisdictional entity maintains only its own accounts.

The first objective of this thesis is to develop a form of data organization that clearly shows who pays what taxes to whom, and, how the revenue is spent. The data format not only should be easy to read but also to extend to any state or region of interest. We will show it for the county areas of Iowa. The second objective is to analyze the data looking for patterns of fiscal situation (balance/imbalance) that differ across types of locations. These results may be useful for tax policy decisions, location, and residential choice analyses.

I present a multi-region, multi-jurisdiction social accounting matrix (SAM) to organize the data on government revenue and expenditure. Fiscal SAMs are described in the third chapter. To construct this matrix one must document the fiscal flows to and from agents in each local jurisdiction and the state and federal government. To determine the appropriate attributes of the fiscal social accounting matrices, I surveyed the literature about public good provision, estimation of government revenues and expenditures, and previous studies of fiscal accounts in national income and product accounting. The literature review follows this introduction.

A social accounting matrix (SAM) is basically a matrix organization of data, for a given period of time, in rows and columns. The basic principle is that of double entry bookkeeping in accounting. What is incoming to one account must be outgoing from another. Each account consists of one row and one column, identically labeled. In a SAM, the double entries are represented by just one number in a matrix. This is the framework used to organize the government accounts data. The SAM matrix shows the fiscal flows for each level of government simultaneously. It also shows which agents pay or receive for each county area within the state and nation. The organization of data in a SAM framework is critical because it results in more complete and consistent fiscal accounts than any other method, and thus more accurate fiscal indicators.

Despite its usefulness, there are virtually no precedents for the multiregional-multijurisdictional SAM approach to fiscal accounting. Only a few textbooks on urban economics present a treatment appropriate to the study of intergovernmental relations (e.g., O'Sullivan, 1996). In addition, a book by Ladd and Yinger (1989) and the publications of the (soon to be disbanded) Advisory Commission on Intergovernmental Relations (ACIR) give particular attention to this problem. The emphasis in these publications is on urban or metro area analysis. This thesis will study both rural and urban (metro/nonmetro) fiscal patterns.

Actual data on the taxes and government expenditures for the 99 counties of Iowa, the state, and the USA is used to demonstrate this new accounting method. In this thesis, the 99 county SAMs appear in a more informative regional aggregates: metro/urban/rural.

Once the fiscal data by county is correctly organized, I analyze the data to determine what patterns, if any, can be distinguished. A variety of measures of fiscal burdens, effort, and relative benefits are calculated for each county. Using multivariate analyses I test whether patterns in these fiscal measures relate to the rural/urban characteristics of the counties. In other words, I will look for any conditionalities between types of location and fiscal shape. This empirical work is presented in the fourth chapter.

Conclusions about differences in fiscal patterns between rural and urban counties are summarized in the last chapter.

LITERATURE REVIEW

Fiscal Federalism

Most government services that directly affect people's lives are administered by state and local governments. Examples of these are education, health, police and fire protection services, and transportation. Among the federal government programs, social security and defense are the most familiar to people. The federal government of the United States also provides intergovernmental transfers to lower levels of government to help finance the provision of education, health, transportation and other things. This system of shared finances as well as authority is known as "fiscal federalism".

The Constitution of the United States establishes that federal and state governments will share responsibilities to provide public goods. In 1992, total government expenditures amounted to about 41% of U.S. GNP.[1] State and local governments expenditures amounted to about 19% of U.S. GNP.

Local governments are the "creatures" of state governments, and from the states they derive their taxing and spending powers. Analyses across periods show that this federal system has always been changing. The government sector has developed into a complex set of institutions, with less and less clearly defined functions at each level (Swartz and Peck, 1990; Walzer and Chicoine, 1981). Most authors agree that the U.S. is no longer a system of federal coordination but one of federal cooperation (Oates,1991).

The optimal jurisdiction size is also a complicated question. Due to scale and scope economies as well as externalities, public goods are appropriately provided to varying sizes of

---

1. Calculated from Government Finances 1991-92 (U.S. Department of Commerce, 1995), and Survey of Current Business:1994. Federal transfers to state and local are excluded from federal expenditure and included as State and local expenditure.

clientele. This means that jurisdictions (market areas for public goods) are likely to overlap. Citizens may often be within the jurisdiction and taxing power of more than one local government, as well as of state and federal governments. A hierarchy of districts is called *coherent* if all units that belong to one level belong to one and the same district in the next level (Serra, 1996). For example, all 50 states belong to the U.S.A., and all 99 counties of Iowa belong to the State of Iowa. There are more than 86000 local governments ranging from counties to special districts whose functions vary from state to state. Many of these local units present some form of jurisdictional overlapping. In some cases this leads to non-coherent districts (i.e., a school district that crosses county boundaries), and complicates the presentation of multi-region multi-jurisdiction fiscal data.

The system of federal cooperation has been studied by looking separately at each level of government. Despite the practical and theoretical importance of the relationships and interdependencies among different levels of government most emphasis is still on government accounts at each distinct level. Finally, since most research is for national audiences, an important part of it is dedicated to federal and state-local government finances (revenues versus spending), in two separate blocks. There are few studies concerning state and local fiscal accounts in any detail.

Public Goods Provision

The main responsibilities of central governments are, first, stabilization (Keynesian economic policy) and second, redistribution of income and wealth (social policy) (Musgrave and Musgrave, 1959; Musgrave, 1976; Oates, 1977, and 1991). This is because fiscal policy by a local entity is ineffective due to the openness of small regions and the mobility of the agents across regions. Furthermore, since economic cycles and social disparities are economy-wide but potentially of different levels of severity across regions, inter-community transfers and central coordination is most appropriate.

Another important government function is to support the efficient allocation of resources. The resources of any economy are divided between private enterprise and public good provision. A particular mix of public goods must be chosen. Local governments, as well as the national government, play important roles in these choices through the ways in which tax revenues are collected and spent.

There are cases in which the role of the national government in the provision of public goods has wide consensus. Public goods that are totally non-excludable and non-rival (the 'pure' public goods) and whose benefits are nation-wide should be provided by the central government. When the distribution of benefits is spatially limited, or, when there is some level of excludability and/or rivalness, lower levels of government may have a role.

Following the seminal papers about public good provision by Samuelson (1954) and Tiebout (1956) there has been a considerable amount of theoretical research about "how much and what mix of public goods should be provided?" In a federal system, like that of the U.S., the discussion about the role of local governments in public goods provision has became an important piece of the literature. In Tiebout's model, frequently viewed as a guide to the optimal mix and level of public goods at the local level, consumers reveal their preferences by "voting with their feet" (migrating). According to Tiebout "there is no way in which the consumer can avoid revealing his preferences in a spatial economy." Heikkila (1996) found that municipalities in Los Angeles county behave as Tieboutian clubs. His results show census tracts mapping into homogeneous groups: municipalities. He also found that there may be higher level clustering, not necessarily coincident with geographical boundaries.

Tiebout's model is also seen as the origin of club theory. Cornes and Sandler (1986) define club as a voluntary group that derives excludable benefits from sharing production costs, members' characteristics and/ or excludable goods. Under this mechanism there should be a tendency towards the formation of homogeneous communities in terms of preferences for local public goods. One important assumption implicit here is that people have full knowledge of the differences among communities. In particular, they must know the revenue-expenditure behavior of each local government.

The advantages of local provision of public goods, and the benefits of inter-jurisdictional competition have been argued by many in the literature (Zodrow,1983; Rosen, 1995; Mills and Hamilton, 1995). Efficiency gains from local control over the services provided as well as lower costs are on the pros side. Arguments against local control include multiplication or proliferation of costs when there is a large number of jurisdictions (Zax,1988). If local governments are too small, it is impossible for them to capture any economies of scale. Small jurisdictions also have difficulty internalizing benefits that otherwise spill over outside their jurisdiction. Also, the more numerous are local governments the more opportunities there are for administrative mismanagement.

In the discussion about local public goods provision and appropriate jurisdictional size, two key concepts are *efficiency* and *equity*. There is always a trade-off or compromise between them.

Efficiency in public goods provision is commonly defined as the level in which there is no possibility of making someone better off without making someone worse off. According to that definition taxation is almost always inefficient. However, we can agree that taxes have a positive counterpart in the goods and services provided by the government. In this context efficiency refers to 'as efficient as possible' (Baumol and Blinder, 1995). To take advantage of economies of scale or to internalize all benefits may require a large jurisdiction size. To allow for individual control over the packages of goods and services to be provided (the issues of revelation and homogeneity of preferences) may require a small jurisdiction size.

Equity is a criterion concerned with fairness. One equity principle : *horizontal equity*, may be stated as "equal treatment of equals." Individuals in the same situation should be taxed or benefitted the same way. All individuals have the right to enjoy the same benefits of public goods - at least some minimum amount- everywhere. They should pay the same for a given level of public goods. A good example is education. Due to scale economies, larger jurisdictions may be advantageous. On the other hand, smaller regions are more likely to be populated by citizens with more homogeneous tax capacities and public good needs (Benabou, 1996).

Oates (1991) makes explicit the tension between the concept of economic efficiency and equity considerations regarding minimum service provision. To ensure this minimum has been one important purpose of intergovernmental grants. The argument about the advantages of lump-sum grants and more specific grants is the same as that between the benefits of local autonomy from an efficiency point of view and the necessity for commonly prescribed standards for equity reasons.

Vertical equity is another version of equity. It is based on the 'ability to pay' principle. People with a high ability to pay (income, property assets, etc.) should pay higher taxes. This concept undergirds the progressivity of the tax system, and enlargement of jurisdictions may work against it because of changes in the tax mix (property, income, profit, etc.) or because of the distribution formulas (per head, per acre, per dollar).

A third concept of equity concerns benefits relative to burdens: those who receive the benefits should pay the taxes. This is a controversial notion in that it conflicts with the notion of what is a public good (nonexcludability and nonrivalness). It is also a principle that works better among small, homogeneous groups.

This thesis does not attempt to answer the questions about which local public goods should be provided or what is the optimal jurisdiction size. It does provide, however, a framework to document fiscal accounts suitable for investigating variations across types of regions in vertical, horizontal, and burden/benefit versions of equity. The framework should also make it possible to document changes in these patterns over time.

Interdependencies

The federal government supports local public good provision in mainly two ways: direct operation of programs (e.g. social security), or by providing funds to lower levels of governments (e.g. education). The funds that the federal government gives to state and local governments are usually referred to as intergovernmental transfers, grants, or grants in aid. Intergovernmental funds come in various forms: (i) *Lump-sum grants* are monies provided with minimal constraints on their use. They may be *unconditional*: no constraint at all, just a grant (i.e. general revenue sharing, until 1986); or *conditional*: earmarked for a specific program, or area of a program. The sum of grants for a program is called a *block* grant. (ii) *Categorical* grants are directed to narrowly defined activities. Another way to characterize grant money is by looking at the matching requirements. *Matching grants* specify an amount of federal money for each dollar (total) spent in a program. That means the recipient government has an obligation to match the federal money at a specified rate. Matching grants may be closed-end or open-end depending on the specification of a maximum amount for the federal grant. Matching grants are usually identified with categorical grants but there are some block grants with matching requirements, for example "ground transportation block grants" in fiscal year 1993. (iii) *Tax expenditures* are implicit grants. They consist mainly of deductibility of local taxes and exemption of interest from local bonds when paying federal taxes. This type of operation is sometimes viewed as a way of tax exportation for the local levels of governments. By deducting local taxes from the tax base, tax payments to the federal government are reduced. There is no agreement on how to measure the deductibility effects.

Particular attention has been given in the literature to the evolution and changes in the composition of federal intergovernmental transfers (Gold, 1990; Bahl, 1990). Intergovernmental flows grew steadily in the postwar period becoming an important source for the growing expenditures by lower levels of governments until 1976. In the recent two decades, there has clearly been a reduction in the level of federal support, and a shift of fiscal financial responsibility to state and local governments. This shift in responsibilities has been viewed as driven by a change in the focus of policies from welfare issues to economic development, or, from distributional to efficiency issues.

Gold (1995), notes a reversal in this federal aid trend after 1992. Federal aid to lower levels recovers to near 15% of the federal outlay (calculated from data in the U.S. Statistical Abstract, 1995), a share similar to that of the 1970s.

The devolution of fiscal responsibilities to lower levels of government means that local areas may suffer because there are differences in fiscal capacity (in the sense of "ability [of local government] to perform") across jurisdictions. Multi-state analyses of the decade 1975-85 have shown that one way or another, states have managed the increasing responsibility and "they are doing well" (Shannon, 1990). By raising sales taxes, user charges, and royalties, for example; and also by increasing income taxes; lower level governments have been able to compensate for the decreased federal support.

Gramlich (1990) has compared a normative model of what a federal system should do with the actual structure of expenditures and taxes. What each level of the federal system should do is analyzed according to the general criteria of range of externalities or spill-over of benefits and possibilities of policy application (redistribution of income at local level may induce local mobility). His conclusions are that with a few exceptions, which can be corrected, the system is working well, in the sense that each level is doing what it is supposed to do.

Despite the dearth of state-local empirical studies, analysts are quite aware that there are variations in the fiscal capacities and costs of local public goods provision across states. National economic situations affect the ability of local governments to provide public services in different ways across communities. In addition, communities have idiosyncratic problems. Fiscal problems may come from mismanagement or bad decisions, from historical, economic or geographical disadvantages, because of preferences for high-quality services, or because of severe tax limitations set by their state. Given the importance of local public services provision and its dependence on transfers from higher levels of government, we need more detail about intergovernmental fiscal flows and interjurisdictional equity.

Empirical Studies

One strand of empirical research focuses on the historical evolution of the federal system, showing the path, as well as the broader components, of total expenditures. First, the data is analyzed to show changes, at an aggregate level, in revenues and expenditures at each level of government. Figure 1 shows the evolution of aggregated governmental spending in terms of GNP.

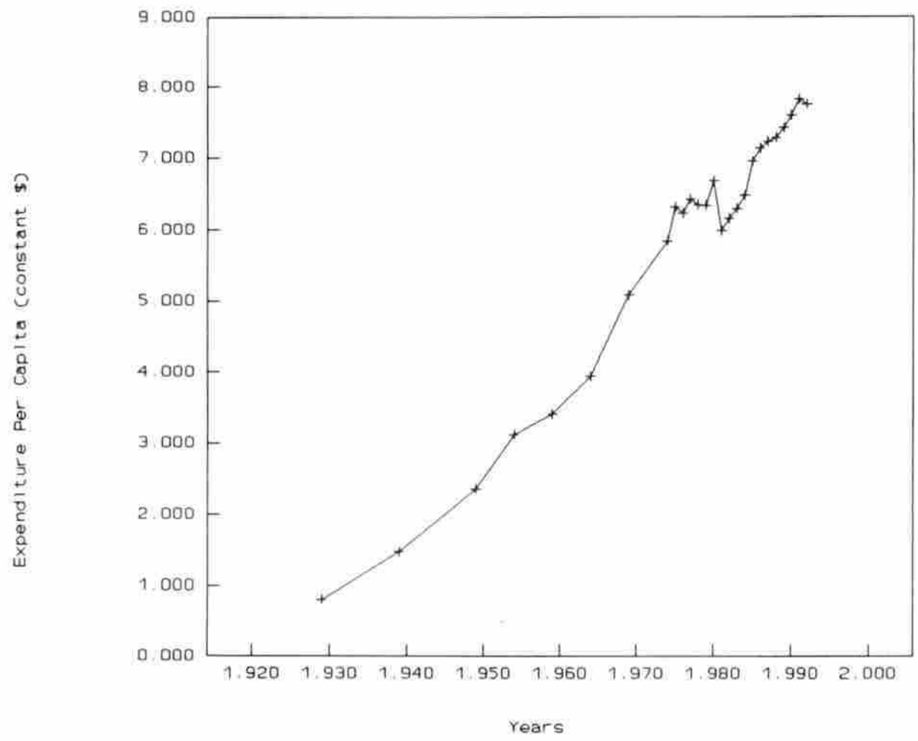

Figure 1 Total Government Expenditures

Total government expenditure grew between 1929 and 1975. The next decade was one of small ups and downs, and, since 1985 total government expenditure has been fairly constant in terms of GNP. However, the composition of total government expenditure has changed over the period. In the early years, state and local expenditures accounted for over 75% of the total (federal was less than 25%). This pattern reversed after World War II, with state and local expenditures falling to about one third of the total by 1949. From then to 1975 state and local spending grew to more than 40% of the total, then again decreased until 1980, rose again and stayed near 50% since 1981 (Child Hill, 1990; Shannon, 1990; Mills and Hamilton, 1995).

The main expenditures of the federal government have been, without big changes, for social security and national defense (Figure 2). By 1992, transfers to states and local governments comprised nearly 12% of the federal budget. The biggest program of state and local spending is education (Figure 3), which accounts for about 30% of the state budget and more than 37% of the local (on average). State government expenditures on welfare programs are also important, accounting

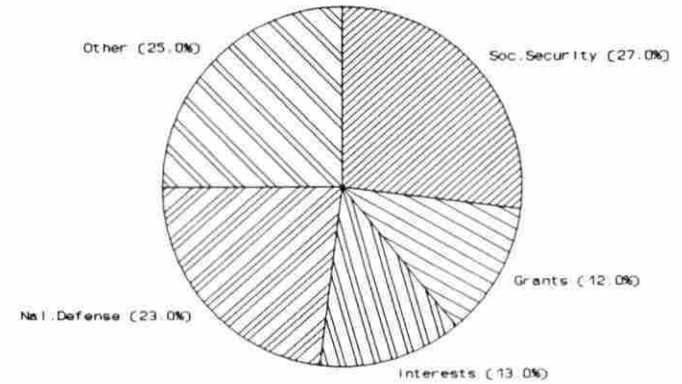

Figure 2 Composition of Federal Expenditures, 1992.

for about 21% of total state expenditures in 1992 (revenue and spending composition is calculated using Government Finances 1991-92 (U.S Department of Commerce, 1995) and U.S. Statistical Abstract, 1995.) The second type of empirical research analyzes changes in the sources of revenue and the objects of expenditure. About 45% of the federal government revenue for fiscal year 1992 came from individual income taxes. This proportion has not varied since 1960. Social insurance revenues have increased from about 16% to 37%, and the share from corporation taxes has dropped from 23% to less than 10%.

For the states, about 41% of their revenue (including borrowing) in 1992 came from sales taxes, 21% from intergovernmental funds (federal sources) and the rest in similar proportions from individual income, charges and "miscellaneous", and insurance trust.

Local governments have basically two sources of revenue: intergovernmental transfers, which was the most important until the 1970's, and property taxes. In 1992, the average local government got 40% of its total revenue from property taxes and another 40% from intergovernmental funds. The remaining 20% came from other taxes and charges.

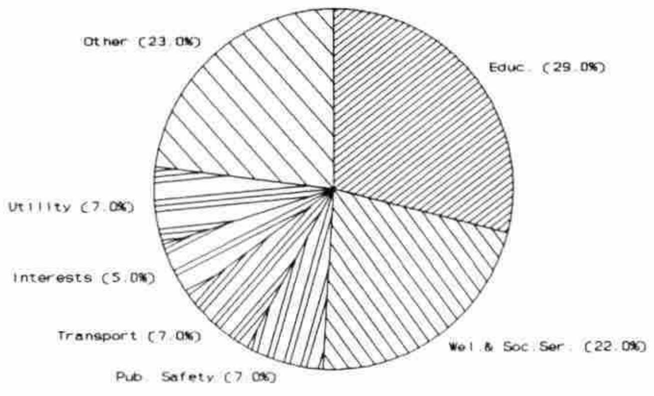

Figure 3 Composition of State and Local Expenditures, 1992.

Estimating Revenue and Expenditure

While the federal government uses its ability to buy and sell bonds along with its ability to debt-finance fiscal operations, state and local governments are subject to some constraints. Local levels may not carry deficits, even though they may have surpluses for use in the future. States may set their own limits on budgetary imbalances, but in many cases (e.g., Iowa) they choose to balance their budgets. In order to know how taxes or spending should be adjusted to maintain budget balance, state and local governments need to be able to predict both revenues and expenditures.

The Tiebout hypothesis about revelation of preferences for local public goods has suggested reduced form models popular for estimating government expenditure. Local expenditure is regressed against per capita income, per capita grants in aid and socio-economic characteristics like population density and ethnic composition, unemployment rates, and land area:

$$X = \alpha I_h + \beta A_f + \delta_1 U + \delta_2 L + \ldots + \epsilon$$

where: X is expenditure (typically state plus local government expenditure); I_h is per capita (individual or household) income; A_f is per capita federal aid; U is the unemployment rate; L is land area. This model is estimated assuming normally distributed errors, ϵ.

The implications from these models have always been consistent with common sense. Expenditures are shown to be positively correlated with income, federal aid, and land area, as well as with any characteristic that identifies social disadvantages like high unemployment rates or high percentages of nonwhite population. There is some disagreement about whether expenditure is positively or negatively associated with population density and degree of urbanization. Bahl (1990), claims that there may be some advantages to urban agglomerations.

Even though it is still used as a partial strategy (Bahl, 1990), this demand-side approach of the public sector problem has been seriously criticized (Inman, 1979; Hulten and Schwab, 1988). Two of the most evident weak points are (i) the aggregation of state and local expenditures and (ii) the treatment of grants-in-aid. First, consideration of state and local expenditures together in a model of an aggregation of small areas may give an erroneous idea of the behavior of the individual areas. Because of the differences between these smaller units, their individual reactions may be far off the average. The model results may be not valid for a particular small jurisdiction. Second, the treatment of grants suffers a problem of simultaneity: does more grant money cause more expenditures, or does more expenditure require more grant money? But there is also a problem of specification. There are two main categories of grants: lump-sum and matching grants, with distinct effects on local budgets. Lump-sum grants have no restrictions and so they have clearly a pure income effect, i.e., relax the budget constraint. A matching grant intends to stimulate spending on a targeted service and, as we said before, requires matching funds from the local entity. This means that for every dollar spent by the local government on a program, they can provide more than a dollar's worth of that service. Thus, matching grants affect relative "prices" and changes cause both an income and a substitution effect.

Figure 4 shows the different outcomes that will arise in general in a two goods case under these two forms of budget change. This figure contrasts the effects of the same amount of intergovernmental transfer in the form of lump sum or matching grant on the level and mix of public goods provided. In case (a), preferences are illustrated as homothetic: neither of the public goods (x and y) is more a necessity or luxury than the other. The optimally chosen mix of goods clearly depends on whether the intergovernmental transfer merely relaxes the budget constraint or whether it alters the relative provision costs to the local government. Even though some deviation of resources is unavoidable, the price effect that a matching grant causes ensures that a higher proportion of the money goes to the targeted good.

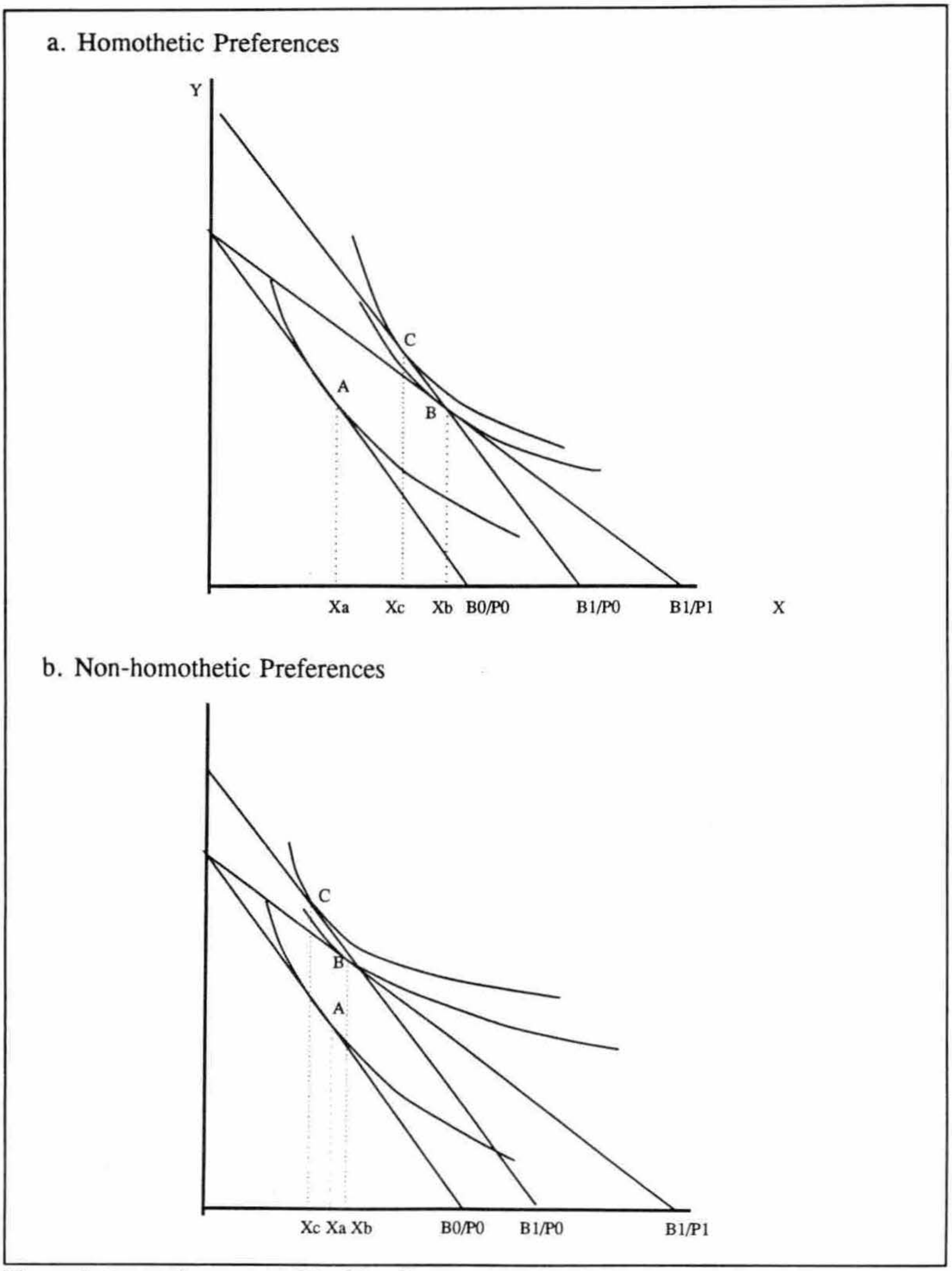

Figure 4 Lump-Sum versus Matching Grants

Decisions about the mix and level of public goods provision also depend on local preferences. In figure 4, case (b) illustrates non-homothetic preferences. Intergovernmental funds that are lump-sum clearly favor the provision of "luxury" public goods. It is also possible that the quantity of the targeted good is proven to be inferior after the lump-sum grant when it is a necessity type of good (x in the diagram).

Empirical research, summarized by Inman (1979), found the demand for most public services to be mildly inelastic with respect to prices. An income elasticity also inferior to unity (inelastic) was found for most of the services except housing, recreation and welfare. In particular, some results for the effects of lump-sum aid over expenditures were much lower than the determinant models found. In other words, lump-sum money is more likely to just replace local spending.

A third problem with the demand-side estimation of expenditure is an omitted variables problem. There is no hypothesis testing. Only available data on demand determinants is used. In general, this threatens the validity of conclusions because of the possible omission of significant (potentially correlated) variables. Pidot (1969) recognizes this double problem of traditional approaches: omitted variables and also existence of multicollinearity when a larger number of explanatory variables is considered. He uses a principal component analysis to reduce thirty original variables to six uncorrelated components. This method ensures accounting for much more variable effects on the level of government expenditures, without the problem of correlation.

An alternative way to predict revenue and expenditure simultaneously is to pose a problem of preference maximization subject to a budget constraint (Henderson, 1968; Gramlich, 1969; Inman, 1979). The idea is that any level of government, each with its own peculiarities, faces the problem of financing public goods provision. This framework seems suitable for the analysis of the effects of policy changes on the allocation of government budgets, but it is also useful for analyzing the question of the optimal size and number of jurisdictions. Bahl and Puryear (1976), Oates and Wallis (1988), and Zax (1988) do not formally state it but their research may be seen as applying this framework.

A very simple specification of the model would start by considering an objective function of the form:

(1) $U(G,Y)$,

where U is a continuous, quasi-concave utility function representing personal preferences over local services output (G) and disposable private income (Y) (income plus transfers minus taxes). In other words, each person chooses a mix of public and private goods.

Legally, local governments should balance revenues and expenditures. Thus, the choice is subject to a budget constraint:

(2) $Rev = Exp$.

Government revenues come from taxes raised from the community (T) plus intergovernmental aid from state and federal government (A). Their expenditures are determined by the amounts of labor (L), capital (K), and other intermediate products (OI) they need to produce a certain amount of public services.

The level of service that each person or household enjoys (G_{hi}) depends only on the output of each service (Q_i) and the total number of persons in the community (N): $G_{hi} = g(Q_i, N)$, where h refers to a particular unit of consumption (household or individual) and i refers to a specific type of public good or service. More precisely it is accepted that

(3) $G_{hi} = Q_i/N$.

Assuming, for simplicity, exogenous factor prices and a linear homogeneous production function (so we have constant average costs) we can express total spending as: $\sum_i c_i \cdot Q_i$, where c_i is the average cost that depends on factor prices. Then the budget constraint (2) states that tax revenue plus aid must cover costs of provision:

(4) $T + A = \sum_i c_i \cdot Q_i$.

People's preferences are defined over the vector of public services (G) and disposable income (Y) which reflects the consumption of private goods. This second element in the objective function may be used to translate the aggregate budget constraint into an individual one. Disposable income for each household (h) is defined by:

(5) $Y_h = I_h - T_h$,

where I_h is before- tax income and T_h are the effective taxes paid by the household. T_h is net to take into account possible tax credits. Using equation (5) we can get an expression for T and using (3) one for Q_i. Substituting these expressions for T_h and Q_i into (4) and aggregating over all households we have the budget constraint expressing the income (plus transfers) expenditure relationship that covers public goods and disposable income:

(6) $I + A = \sum c_i \cdot G_i + Y$.

The solution to the constrained optimization problem provides demand equations for each public good (G_i) and another for private good consumption that depend on prices and income (I).

This is a very simplified exposition of the problem of optimal public good provision. Many major issues remain to be considered, such as: how are utility functions defined?, whose preferences (if all are not identical)?, and, what about debt financing?. The "median voter" assumption is a popular approach to the first issue. Other social choice models are also used. The intertemporal issue is considered by Inman (1979) and Hulten and Schwab (1988).

Another oversimplification is the assumption of constant returns to scale technology for public good provision. It is not realistic. It is important to have a more accurate specification of the production process. Service output and factor inputs are actually simultaneously determined. We should include a production function as another constraint in the model. We know there are very important scale effects in public goods provision. This means that a flexible functional form that can be homogeneous of degree other than one should be estimated. Also, between public and private goods consumption there are other variables, besides number of persons, to be considered. Most goods and services provided by government share some degree of non-rivalry and non-excludability. We discuss below how an exponent between 0 and 1 on N is one way to account for non-rivalry. But because of these characteristics, spill-over effects or environmental interdependencies are expected. Hence, how much people benefit from public expenditures depends also on the magnitude of these effects. An example is expenditure on education. There is evidence that achievements vary across different environments. Hanushek (1995), in an updated review of the studies about public education, shows the importance of cultural level of classmates in individual's achievement.

As we mentioned before, here public goods are treated as totally rival ("private") goods. Completely congestable goods may be assumed for simplicity, but then one of the intrinsic characteristics of a public good would be ignored. To allow for non-rival effects, the model should state equation (3) using N to the power of π, where π in the interval (0,1) represents the degree of rivalness, from $\pi=0$ (non-rival) to $\pi=1$ (completely rival). Empirical estimates of demands for public goods, through non-market techniques, have focused on estimating this (π) exponent to test for the degree of rivalry or congestion (Cornes and Sandler, 1986).

There are practical problems with how intergovernmental aid (A) is measured and modelled. First, A should be disaggregated into A_f (federal) plus A_s (state):

(7) $A = A_f + A_s$.

Second, lump-sum and matching funds must be treated separately:

(8) $A_f = A_{fl} + A_{fm}$,

(9) $A_s = A_{sl} + A_{sm}$,

where the second subscripts l and m stand for lump-sum and matching funds respectively.

The budget constraint for this case would have the form:

(10) $T + A_{fl} + A_{sl} = \sum_i c_i(1-m_i) \cdot Q_i$,

where m_i is the proportion of cost paid through matching grants from federal and/or state government.

Finally, there is the data problem. To properly estimate these models , at local levels, we must be able to distinguish block from categorical grants. It is necessary to have data on at least the total amount of lump-sum transfers ($A_{fl} + A_{sl}$) and the specific matching rates.

The next chapter will explain a format for organizing published information on fiscal flows in a way that helps highlight these distinctions while keeping track of total outlays and revenues.

Measuring Fiscal Performance

There has been interest in interstate differences in fiscal performance for a long time, but the topic has gained importance each time big changes in federal policies are contemplated. 1996 is one of those times. Traditionally, analysts and policy makers have relied on various indicators of fiscal "capacity" and "effort" to address how to distribute intergovernmental grants or how to help depressed areas provide a minimum level of services.

Citizens of each state and local government may choose to use their own tax rates to finance local public goods provision. Thus actual revenue collected varies according to local rates and locally desired spending levels. To measure "fiscal capacity" is to determine how much revenue could be raised with common taxes at common rates.

The Advisory Commission on Intergovernmental Relations (ACIR) has been working on improving measures of fiscal capacity and effort at least since the 1960's. Their 1986 report provides a good summary of the available indicators of fiscal capacity, pros and cons of the various measures, and their different uses. The report emphasizes the distinction between *individual ability to pay* taxes and other levies and the *government ability to raise revenues*. The ability to pay taxes is a function of the individuals' personal income, while the governments' ability to tax depends not only on personal income but also on the tax instruments and bases available: property resources, types of businesses, and the local composition of taxable resources; as well as on their opportunity to *export* taxes. The ACIR criticizes indexes based solely on personal per capita income (which are widely used) because such indexes emphasize only the individual ability to pay taxes and ignore other tax bases.

Other indicators, based on gross product or taxable resources, may have advantages in terms of the span of resources covered but they are still based on individual ability to pay. Two indexes are proposed as more suitable measures of governments fiscal capabilities: the Representative Tax System (RTS) and the Representative Revenue System (RRS). Those indexes try to take into account not only all revenue sources and types inside the region, but also revenue coming from outside (e.g., tax exporting). They differ in that the latter includes all government revenue, while the former includes only taxes. RTS and RRS indexes are not available yet at the sub-state level (ACIR, 1986).

The problem of tax export is especially important when trying to assess the burden that a particular community carries. The fiscal capacity of a given area does not depend only on its local bases but also on non-resident induced activities. The levy of tax on income or product at its origin raises costs and thus price. It may be passed forward or backward depending on the elasticity of demand. If either backward or forward transactions involve out-of-region agents, taxes may be "exported" out of the region. A recent study by Morgan et al. (1996) identifies measurement problems and presents an evaluation of regional tax exporting . They analyze tax exporting between U.S. regions (defined as groups of states) and its relation to economic growth and welfare. They found different levels of tax exporting between regions and also in the same region under different scenarios. Another way of tax exporting is in the system of state-local tax deductibility from federal government taxes. However there are no estimates of the importance or magnitude of this type of tax exporting.

Revenue "capacity" (C_r) of any particular area is defined as the total amount of revenue that would result by applying , within the area, the national average rate for each State-Local revenue source:

(11) $C_r = \sum_i t_i \cdot B_{ir}$,

where r is region, t_i is national average tax rate on base i (calculated as total collection nationwide divided by total national base for that tax or revenue), and B_{ir} is the appropriate tax or revenue base estimated for each region. To allow for comparisons between regions, an index of fiscal capacity is constructed by dividing the region capacity per capita over the U.S. capacity per capita.

Regardless of the definition or measure of capacity, revenue "effort" is the expression of the percentage relation between actual amount of revenue raised by a government and its hypothetical capacity:

(12) $E_r = (\sum_i R_{ir})/C_r$,

where R_{ir} is the actual tax collection on tax base i for a particular region. The actual amount of revenue raised depends on the particular level of taxes in that region and on the proportion of the estimated base that is being used.

According to ACIR (1991) (Measuring Fiscal Capacity, various years), Iowa had a fiscal capacity of 93% (RTS based) with respect to U.S. total, ranking 28th among the 50 states, and 100% of fiscal effort (ranking 15), in 1991 (Figure 5). If RRS is used, Iowa's fiscal capacity amounted to 92% of the total U.S., and its fiscal effort to 106, ranking 7th among the 50 states.

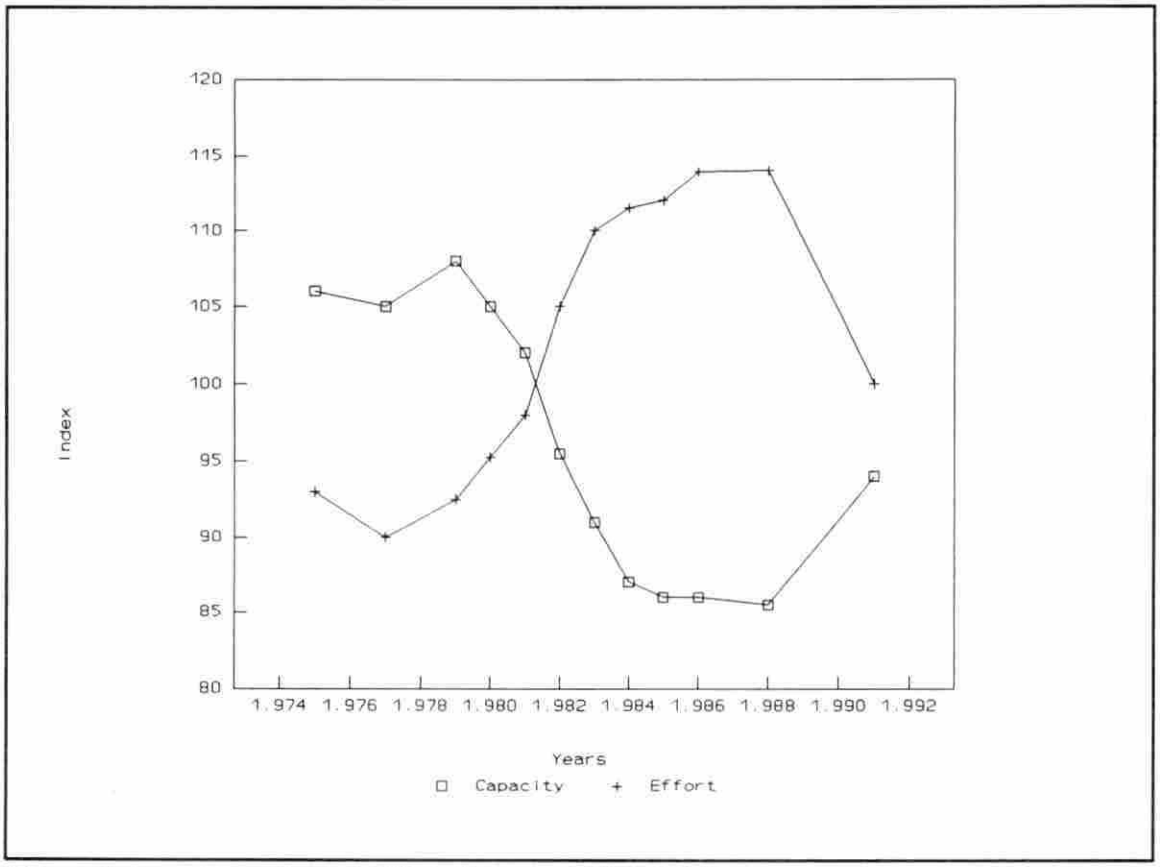

Figure 5 Iowa Capacity and Effort (Source: ACIR, 1991)

Actually, Iowa's fiscal capacity is a little lower than the national average: sources of revenue (i.e., nominal incomes, taxable property valuations) are lower than average. The 100% effort index shows that Iowa extracts all the taxes it can in terms of the national representative rate. However, the historical evolution shows that Iowa's capacity was over 100% until 1981-82, when farm property values suffered a crisis. In fact, agriculture's property taxes declined as a percentage of total property taxes and also with respect to assessed values, about that period. (During 1983 agricultural residential property was moved to the residential category which has distorted comparability over time.) The fiscal effort index has been almost a mirror image of the capacity index during the period. This implies a fairly stable revenue index over the same period.

Urban Economics, first concerned about the decline of big cities, has also emphasized the necessity of "fiscal health" measures and the importance of "community" analysis (O'Sullivan, 1996; Mills and Hamilton, 1995). The focus of empirical analyses in this area has been specifically a city or a MSA. The question about the performance of local governments is not a simple question about how much revenue they raise nor even about having balanced budgets (legally they must) but a question about how they work. Are the services provided the quality and quantity people want, or, do they pay for what they get? Part of the research in the Tiebout tradition maintains that local governments are doing well. Through capitalization in housing values of the fiscal differences, consumers ultimately pay the "right" prices for local public services and local governments are providing what is demanded (Hamilton, 1983; Mills and Hamilton, 1995). In this way, efficient provision of public goods would be achieved. However, there are claims that more work is needed to fully understand this issue. The fact that not only fiscal differences but also other amenities are capitalized into household values complicates things. Decisions to vote with one's feet may be not only based on the package of services and taxes offered by each government (Rose-Ackerman, 1983). And there are also equity implications in this mechanism: it may be the base of intolerable differences in the quality of public services across localities. The equity and efficiency trade-offs mean that each aspect should be considered explicitly.

Bennet (1980) compares fiscal situations among regions. He summarizes the results of studies based on different measures. Bennet defines *fiscal capacity* in terms of the specific tax base, either using a representative set of tax bases as ACIR does, or, just money income for individual income taxes, property values for property taxes, and so on. *Fiscal effort* (E_{ir}) is measured as the ratio of revenue raised (R_{ir}) to fiscal capacity (C_{ir}) for each revenue source:

(13) $E_{ir} = R_{ir}/C_{ir}$,

where subscript i denotes source and r denotes region.

Then he describes two concepts that may be useful in comparing effort between regions. First, *fiscal pressure* is shown as actual effort index against the change in effort relative to effort in a base year. Second, *fiscal severity* shows how local effort has changed as local income changed. He plots the level of revenue collected for different combinations of effort and capacity to illustrate *fiscal severity*. Bennet also proposes a *final fiscal incidence* (FFI_r) measure defined as benefits (expenditures in) minus burden (revenue from) by income group. A simplified formulation may be:

(14) $FFI_r = \sum_i c_{ir} \cdot Q_{ir} - \sum_i R_{ir}$,

The first part of the right hand side of (14) represents the expenditures into a region on public goods and services, and the second part expresses tax revenues paid by agents in the region. While it is easy to identify the amount of tax revenue paid (abstracting from issues of tax exporting) it may be very difficult to identify the orientation of actual payments received by the suppliers of public goods and services for the region. Education services provided to region X may be paying for salaries to teachers residing in neighboring region Y, for example. This data problem will be addressed in the next chapter. Pommerehne (1977) proposes the same measure for fiscal incidence at each level of government and overall.

A variation called *final fiscal transfers* is identified by Bennet as expenditure spill-overs minus tax export to other jurisdictions. ACIR and Ladd and Yinger (1989) present estimates of tax exporting.

Ladd and Yinger (1989) report that most work is just an analysis of the trends in socio-economic factors, rather than any investigation of how these factors influence fiscal situations, especially at the city level. To measure the city's ability to raise revenue, they propose the use of a *uniform* tax burden on the residents, instead of just an average tax rate. Actually, they criticize the ACIR system because it ignores intercity differences. Their index of *standardized fiscal health* focuses on revenue capacity and expenditure needs of a city. Revenue raising capacity (RRC_r) depends on tax burden on the community residents, measured as proportion of income:

(15) $RRC_r = K \cdot Y_{pc}(1+e)$,

where K is the standard burden, Y_{pc} is the per capita income and e stands for the proportion of non residents tax base (taxes that the community is able to "export).

Expenditure needs are calculated as the amount of revenue necessary to provide average services per capita in each city. Standard needs (SN_r) are the sum of cost indexes for a selection of public services in each city weighted by city differences with respect to the average. Stated in a very simplified form:

(13) $SN_r = \sum_i w_{ir} CI_{ir}$,

where w_{ir} are the region weights for each selected service and CI_{ir} are the costs indexes for each service in the region.

Standardized fiscal health is the difference between revenue-raising capacity (RRC_r) and standard expenditure needs (SN_r), expressed as percentage of capacity:

(14) $(RRC_r - SN_r)/RRC_r$.

This index is then compared with "actual" situations. Actual revenues include variation due to restrictions imposed by states (taxing allowed and responsibilities assigned). Actual revenue also include intergovernmental transfers. Since intergovernmental transfers provide an average of 40% of local government revenues, this inflow is important in leveling (or exacerbating) differences across regions.

Data Organization

To date, available fiscal data is usually organized in separate tables showing revenues and expenditures of a single level of government: local, state or federal. Government data is also often presented aggregated nationally within each level (e.g. all local counties or all 50 states). Fiscal accounts aggregated nationally at each level of government have been used in early empirical studies of the three tasks of government: stabilization, redistribution, and allocation (Engerman, 1965; Netzer, 1969).

In a paper presented to the Conference on Regional Accounts, Burkhead (1964) summarized an important part of the previous research about the treatment of the public sector in regional accounts. Regional (sub-national) consideration of public finances issues, and also that of separate accounts for the different levels of government, are his main concerns. Burkhead proposed that detailed accounts of revenues and expenditures be published for each of the three levels: federal, state, and local. Now, the actual presentations of tables from the Census of Governments, and other government finance publications, are very close to what Burkhead proposed. An abstraction of his original proposal is shown in Appendix I.

Bennet (1980) proposed a matrix representation of the different levels of government activity. He presented a matrix structure to show the vertical and horizontal interrelations: the movement of funds between national and lower levels of governments as well as between units at the same level. Fiscal 'burden' and fiscal 'benefits' for a specified jurisdiction could be calculated with a similar matrix. Table 1 is a simplified version of Bennet's revenue matrix.

The idea behind Bennet's proposal is that intergovernmental flows are important to a region's fiscal performance. The matrix representation suggested helps to visualize clearly a set of interrelations among different levels of government. Two aspects of the problem, however, need more discussion. First, he shows the flow of spending into the community separated from the flow of revenue raised in the same community. Because of that separation, some of the interconnections may be hidden. (It is not clear how one would compare what one region pays with what it receives.) Second, Bennet measures "benefits" as the level of public good expenditures undertaken by the government with respect to the region. It is not necessarily true that the costs of public good provision measures the benefits received, nor is it always true that expenditure is incurred as income within the region.

Table 1 Revenue Matrix (Bennet)

	Specif. Juris.	Higher Level	Similar Level	Total
Specified Jurisdiction	revenue raised and spent locally	grants and intergov. transfers	local transfers (paym.for shared services)	Total revenue raised locally
Higher Level	revenue transfers to higher levels	revenue raised and spent at higher level	revenue transfers to higher levels	total revenue raised at higher level
Similar Level	local transfers (paym. for shared services)	grants and transfers to other similar governm.	revenue raised and spent in other areas	total revenue for other similar areas

Just because a particular region has a higher level of spending on public safety does not means that it enjoys more protection. It could be because it has a greater rate of crime.

Should the benefits be measured on a cost basis or on a welfare basis? When government spends money we presume it benefits the community in the form of services provided (e.g. higher safety standards or better roads). However, spending on salaries or purchases of goods does not necessarily stay within the community . The place of residence of people receiving salaries from the government and the locations of industries providing goods and services to the government are the actual determinants of 'which' community receives those funds.

Finally, there are the problems of measuring benefit spill-overs and tax export, that have already been mentioned. Consider spillovers in Bennet"benefits matrix": if benefits are measured by the level of spending, then spillovers must be represented by side payments between similar level jurisdictions. Note that one motivation for federal aid to local governments is precisely the fact that spillovers of benefits across regions would otherwise be externalities not enjoyed by local taxpayers. Federal taxing and funding internalizes costs/benefits.

Ideal Fiscal Accounts

Fiscal federalism means that federal, state and local governments are interdependent. Unfortunately, there is no standard way to document the various forms of interdependency. The ideal framework would present local, state, and federal flows simultaneously and would highlight intergovernmental grants between levels .

People may react to uneven fiscal burdens or benefits by migrating (Tiebout Hypothesis). Thus, the ideal fiscal accounts will make it possible to compare one location with another taking all taxes and benefits into account, not just local ones. Local governments cannot redistribute income across regions . Federal programs do redistribute across regions. Local public goods/tax packages may vary because local preferences vary and people "vote with their feet". But the true fiscal status of local areas also depends on state and federal flows in/out of the area.

The ideal accounts should display data on taxes paid relative to expenditures so that the various measures of effort and equity may be calculated, consistently, for each jurisdiction relative to others.

Local and state governments need to be able to predict revenues and expenditures subject to balanced budget policies. Typical accounting formats are already being used that satisfy this need.

The ideal framework for fiscal accounts should also enable one to: (i) identify the allocation of spending, by each level of government, on different programs or on intergovernmental transfers; (ii) differentiate lump-sum (block) from categorical or matching grants; (iii) document the amount of government spending on goods, services, wages and salaries, rents, and transfers received by industries and people, by region. In the next chapter I will develop the "social accounting matrix" framework to display fiscal accounts.

FISCAL SOCIAL ACCOUNTING MATRICES

Social accounting matrices (SAMs) were originally developed by Nobel Prize winner Sir Richard Stone. A SAM may be described as a complete presentation of a society's accounts in a matrix form. These matrices are often used to highlight the circular flow of income from production through consumption, investment, trade, taxes, and public expenditures within a single region. SAMs have proven to be good instruments to show how income distribution is related to production.

To reveal the interrelations, accounts for factors of production and institutions are disaggregated. It is useful to distinguish accounts for decision makers with distinct objectives, instruments and/or constraints (i.e., different prices). An example of a typical national SAM is shown in Appendix II.a. with data on the entire United States for 1987.

SAMs are usually constructed to describe current conditions in an economy as an information base for policy analysis. The construction of social accounting matrices, as a necessary complement of a system of national accounts, is explicitly recommended by the United Nations (U.N., 1968 and 1993). As noted above, the extent of aggregation may vary according to the objectives of the analyst or according to the available data. Pyatt (1995), argues that the United Nations should recommend the use of SAMs no matter what structure each country is able to use.

SAMs are constructed for developing, transition and developed countries. Pyatt and Round (1985) give examples of SAMs for developing countries. An example that is especially relevant to our topic is the work of Pleskovic and Trevino (1985). They apply a SAM framework to analyze public sector contribution to economic activity, through state-owned enterprises, in the Mexican economy. Recently, construction of SAMs is being recommended for analysis of transition economies. Examples of SAMs for developed countries are Round (1995) for the European Community and Kilkenny (1995) for regions of the U.S.A..

Even though a SAM is neither an economic model nor a specification of economic behavior, it is a first step in the process of economic modeling. One important objective of a SAM is to provide the statistical basis for a plausible model (King, 1985). In fact, general equilibrium models require a balanced SAM as the first step in the empirical phase. The construction of a fiscal SAM is also the first step in the empirical analysis for this thesis.

Fundamentals of SAMs

The basic principle of social accounting is that of double-entry bookkeeping. SAMs are square: each account is represented by one row and one column, identically labeled. By convention, the row entries represent incomings or receipts, and column entries represent outgoings or expenditures. This gives the advantage that a transaction between two accounts need be recorded only once. Each element of the matrix represents a transaction between two different accounts, i.e., to i from j. This transaction represents interaction, or *articulation* between accounts i and j.

Because it is a system of accounts, SAM construction follows the same steps that the national income and product accounts construction. Aggregate consistency between total outflows and inflows must be maintained for each account and overall. Budgetary balance and/or market-clearing conditions imply that rows and column sums of each account balance. If consistency at the general level is maintained, consistency of sub-accounts can also be verified with a SAM. This suggest another advantage of using the SAM framework. Even though different agencies may keep accounts in different ways according to internal needs, by using a SAM we can reconcile the potentially different reports from the agencies. Also, by presenting the available data in the SAM format (given the row=column conditions) rather than in separate tables or accounts, we can also solve for missing "data" on interactions between accounts.

Matrix Structure

The generic SAM structure can be constructed to display single national accounts , single region accounts, or interdependent regional accounts equally well. Stone (1961), introduced regional accounting with SAMs. The fully articulated SAM for multiple regions is structured as a system of sub-systems. The within-region transactions appear in diagonal blocks, and the inter-region transactions in off-diagonal blocks. Because of the lack of sufficient information, he proposed the use of pooled intermediary accounts rather than directly articulated region-region transactions. When the regional location of the origin and destination accounts cannot be identified, a "pooled account" can be used to collect all inflows and distribute all outflows among regions. Schemes of both types

Table 2 Regional SAMs

a. Interregional SAM

	Region 1	Region 2	Region 3	*Total*
Reg 1	Within 1	From 2 to 1	From 3 to 1	Reg 1 Inflows
Reg 2	From 1 to 2	Within 2	From 3 to 2	Reg 2 Inflows
Reg 3	From 1 to 3	From 2 to 3	Within 3	Reg 3 Inflows
Total	Reg 1 Expend.	Reg 2 Expend.	Reg 3 Expend.	

b. Multiregional SAM

	Region 1	Region 2	Region 3	Pooled Account	*Total*
Reg 1	Within 1			Pool to 1	R 1 Inflows
Reg 2		Within 2		Pool to 2	R 2 Inflows
Reg 3			Within 3	Pool to 3	R 3 Inflows
Pooled Account	from 1 to...	From 2 to...	From 3 to...		Pool Inflows
Total	Reg 1 Exp.	Reg 2 Exp.	Reg 3 Exp.	Pool Exp.	

of regional systems are shown in Table 2.

Each of the interior blocks may be conceived as complete as any matrix at the national level.

Other examples of regional disaggregation have been constructed by Pyatt and Round (1985), for developing countries. One version of SAM for Sri Lanka in 1970, includes: Factors (capital and labor), Institutions -current account (households, corporations and government), a Combined Capital account, Production activities (six groups of activities), an Indirect Taxes account and Rest of the World. A SAM for Iran in 1970, constructed with a very similar structure, shows 12 activities separately and a subdivision of Households in rural and two categories of urban. They separate capital accounts for households, government, and the Rest of the World. The information for

Malaysia, 1970, was also organized in a very similar structure but distinguishing East and West Malaysia (Appendix II.b). Thus, it is a four block SAM that shows, in the top left block, the internal transactions in East Malaysia and in the bottom right those for West Malaysia. The off-diagonal blocks show the transactions between the two regions. Other examples of regional SAMs are those by Kilkenny (1995), for rural-urban regions in USA and Stelder and Oosterhaven (1995), for the labor market in the northern Provinces of the Netherlands. Round (1995), proposes a schematic form of a bi-regional SAM of Europe that may distinguish between countries that are members of the European Community and the rest.

The Government in SAMs

In the income-product account framework (NIPA) the government is treated as a single final demand sector. In almost all previous SAMs, government transactions are summarized in a single account. There are some SAMs structures distinguishing between current and capital accounts for the government. A SAM for Swaziland, presents one of the most disaggregated Government current accounts (Pyatt and Round, 1985). Main revenue sources are shown separately, then combined through a pooled account, and distributed across the main expenditure categories.

The use of detailed government accounts has been broadly discussed since the 1962 Conference on Regional Accounts (see Hirsch, 1964). It recognized not only the importance of detailed government accounts but also that of regional (lower than national) accounts presentation. Burkhead summarized how the public sector was treated in regional social accounts (1964). At that time, government accounts detailed expenditures across region by central government, but there was no adequate accounting of local government activity within regions. In Burkhead's opinion, the minimum requirement for this information to be useful in public decision making was that information be disaggregated at each local, state and federal government activities by region. Accounts should be classified by function and form of government organization, and detailed expenditures and revenues by region should be presented. Burkhead suggested municipalities as the best unit of regional disaggregation for local government accounts. Since this would mean too much detail in a single account, he proposed that subsidiary accounts could also be maintained for a comprehensive system of regional accounts.

There is no doubt that his proposal described a good way to document the public finances of federated regions. Since then, the increase in available information (i.e., expansion of machine readable data), and, the development of SAMs present us with new possibilities.

The Fiscal SAM

In this thesis I propose a SAM that details the government accounts of the U.S. federal system. Fiscal flows represented in such a framework will have some ideal features. First, the matrix can clearly show whether the allocation of tax revenue for programs is made directly to individuals or as pass-through grants. Second, intergovernmental transfers will be distinguished as lump-sum or matching, at each level of government. Third, since each county's fiscal flows will be documented in the diagonal blocks, tax and spending on programs by county can easily be related to characteristics of the county. Also, very consistent capacity and effort measures at the county level may be calculated for cross-comparisons. Fourth, the cost of public goods provision in each region is documented, and the government spending on goods and services, salaries, and transfers to people and industries in the area are revealed.

Ideally, this social accounting framework can accommodate any number of accounts. This feature allows us to present not only 'within', but also 'between' region accounts showing relations at the same jurisdictional level. Following original conventions, the 'within' regional transactions are arrayed in the diagonal blocks and the 'between' transactions in the off-diagonal. The county level accounts are shown in the upper left corner. State and Federal accounts are in the lower rows and rightmost columns.

Structure

The SAM structure used is simple, and focuses on the objective to highlight patterns of government transactions. The product account is divided into 'activities' and 'commodities'. Each of these categories is an aggregation of a broad range of items. Here we will distinguish only agriculture from other businesses. This bisecting is done because <u>activities</u> represent decision-makers whose expenditures exhaust revenues; while <u>commodities</u> are exchanged in markets where supplies are exhausted by demands. There is an account for factors of production (labor, land and fixed capital) and one for households. Related to each county, we include state and federal government accounts. The rest of the country and the world are aggregated into an <u>extraregional</u> transactions account.

This fiscal SAM is not comprehensive, it is a subset of a complete SAM. Many transactions, ignored here, would be presented in a complete SAM. Lacking complete production accounts, the within-region activities, commodity market, factor and household accounts do clear in the subset of fiscal SAMs. Also, only net flows of money appear. Thus, tax credits are net out of taxes paid, and do not appear as subsidies paid. Also note that no transactions between two units of the same type of agent appear because these net out.

The fiscal SAM documents the tax payments from farmers, businesses, and households in each county to each level of government. It also shows expenditures on goods, services, and government employment from each level of government by region to location of the seller, or the residence of the government employee. This is a transactions-based, rather than a "benefits-based" approach. It does not show any regional allocation of the benefits of public goods provision, which by definition of externalities elude enumeration. It highlights actual money flows between private agents and public entities by location.

Government Accounts

Government accounts are first identified by level as Local, State or Federal. These three levels of government are distinguished because they have different objectives: to provide public goods of differing degrees of spatial excludability and non-rivalness. This also means they have different instruments: different agencies and programs across which their funds are to be allocated. Counties are chosen as the unit of analysis for local government fiscal accounts. Data on counties and the State of Iowa will be used to demonstrate the construction and use of a fiscal SAM. In Iowa, all municipalities are fully within county boundaries. For states in which municipalities are not wholly contained within counties, a separate "municipality" account may be identified.

Governments allocate revenues to *agencies* to conduct *programs*. Agencies must balance their budgets, and programs may be provided by more than one agency. For example, the program called "education" is financed by federal, state, and local education agencies: the U.S. Dept. of Education, state departments of Education, and local entities called school districts. Notice that in the proposed SAM structure, it is not necessary for agency and/or program jurisdictions to be coherent with the jurisdiction(s) of the level(s) of the financing governments involved. Government and agency spending is pooled into program accounts.

Program spending is on *objects*: goods and services, wages and salaries, capital/infrastructure, or transfers to persons. As noted above, one critical task is to trace government revenues through program spending back to the local residents. Thus, program spending is pooled into object accounts, which are allocated across local areas according to the spatial distribution of the transfer-recipient population, the residence of government employees, and the location of economic entities serving government final demands. The task is to trace the expenditures of each level of government through agencies to the resident population in each region.

This is a unique feature of our fiscal SAM. It shows actual outlays on public employment and government purchases of goods and services within the region. Other government accounts document spending on *programs* for the regions, which is clearly not the same as the spending on *objects* in the region. But spending on objects is the pertinent information if we want to measure the impact of government as an income-generating activity in a particular area.

Another unique feature of fiscal SAMs is they distinguish lump-sum from matching grants. When a level of government transfers both money and authority over program spending to a lower level of government, we should show an intergovernmental transaction, i.e., a flow is recorded to the state from the federal government. If only money is transferred, we show direct funding of the program by the higher level of government, i.e., a flow is recorded into a program from the federal government. For example, traditional social security payments go directly to individuals from the federal government. To date, government accounts, agency accounts, and/or program accounts presented in the typical T-format (incomings and outgoings) do not allow one to distinguish *lump-sum grants* (expenditures that the lower level of government has some authority to allocate) from direct program spending. The method proposed here identifies the level of government that allocates a program's expenditure as the level of government (or government agency) which articulates with the program account. For example, if local government have all authority over education spending, the education program account articulates with only the local government account.

As long as agencies are uniquely associated with separate levels of government, one can "collapse" the agency accounts into their respective governments at each level. This simplification further highlights the articulation between governments and programs. An example of an agency which cannot be uniquely associated with a level of government is the local school district. School district boundaries are rarely contiguous with county or municipality boundaries. School districts may have independent tax/spend authorities. Thus, school districts are an agency that is worthwhile to distinguish in fiscal SAMs.

Treatment of Federal Grants

From the literature review, it is clear that the distinction between lump-sum and matching intergovernmental transfers is an important one. The typical accounting framework cannot do this without a lot of "side information." A unique feature of SAMs is that these distinctions can be made clear by the articulation of the entry. Table 3 shows schematically how this distinction operates. Lump-sum transfers allow the recipients to choose the way in which the revenues are spent. This type is represented in the fiscal SAM by a flow from a higher government to a lower *government* (not a program). Categorical grants are tied to particular programs, so are represented by flows from the higher levels of government directly to the program.

While the government-government versus government-program articulation makes clear the distinction between lump sum and categorical intergovernmental transfers, it also means that total revenues at each level of government (calculated as the sum of row entries) will NOT match total revenues reported by state (or local) budget analysts. This is a strength, not a weakness of the proposed structure. The fiscal SAM does not merely duplicate existing information (budget balances as reported by state auditors), but it adds the critical information distinguishing block grants from program spending.

Although this framework allows one to trace the circular flow of fiscal revenues, the current form in which government expenditure data is reported prevents one from constructing the ideal fiscal SAM. The available data does not allow one to distinguish block grants from matching grants or categorical intergovernmental funds. A very valuable effort in that direction is the ACIR document about grants-in-aid programs to state and local governments. This document lists programs as under block or categorical grants, and also details program names and conditions under each type of funding (including approximate matching rates). It is extremely helpful, but the ACIR information still does not identify the amounts of spending by type. Thus, I must treat all intergovernmental funds the same, and cannot distinguish which spending comes with federal authority from spending under more local authority.

Intergovernmental funds for AFDC and Title XIX from the federal government to states are an example. The state just administers those funds, and has the obligation to match them. We treat them as intergovernmental transfers even though this is a typical case were we would show federal government allocating funds into the welfare program. Despite the state intermediate activity, the power of decision here, under the previous form of welfare programs in U.S.A. was held by the

Table 3 Distinguishing Lump Sum from Categorical Intergovernmental Transfers

a. Lump Sum Articulation:

	TAX-PAYER	LOCAL	STATE	FED	*Total Receipts*
Education		l_e	s_e		l_e+S_e
Welfare		l_w	s_w		l_w+S_w
OtherProgr		l_o	s_o		l_o+S_o
LOCAL GOV.	L			B_l	B_l+L
STATE GOV.	S			B_s	B_s+S
FEDERAL G	F				
Total	L+S+F	$\sum_i l_i=B_l+L$	$\sum_i s_i=B_s+S$	B_l+B_s	

Notes: l_i and s_i are local and state spending on programs out of their respective *total* revenues. L and S are local and state *own* revenues. B_l and B_s are lump sum transfers to local and state, respectively.

b. Categorical Articulation:

	Tax-Payers	LOCAL	STATE	FED	*Total Receipts*
Education		l_e	s_e	f_e	$l_e+s_e+f_e$
Welfare		l_w	s_w	f_w	$l_w+s_w+f_w$
Other		l_o	s_o	f_o	$l_o+s_o+f_o$
LOCAL GOV.	L				L
STATE GOV.	S				S
FEDERAL G	F				
Total	L+S+F	$\sum_i l_i=L$	$\sum_i s_i=S$	$\sum_i f_i$	

Note: l_i and s_i correspond to local and state spending on programs out of their *own* revenues, and f_i represent federal categorical spending in each program. Total spending by local and state governments in this case must equal their own revenues L and S, respectively.

federal government.

Actually, AFDC and Title XIX are cases in which is possible to have separate estimates. However, they are an exception and we cannot show it without breaking the consistency of the matrix.

A Fiscal SAM for Iowa

We present a sample fiscal SAM for counties of Iowa. Given the available information we concentrate on the within county (diagonal) blocks. We cannot document fiscal flows among Iowa counties with available data.

Table 4 presents a schematic SAM labeling the flows that articulate any pair of accounts. We will show all revenues collected from tax payers at the local level. The school districts' portion of resources (property tax, education charges, and other) appear as received from the local government instead of directly from the taxpayers. This reflects the real way in which property taxes work, but also allows us to distinguish the sector of origin for these revenues (see Appendix III). Revenues coming from higher levels of government as intergovernmental transfers appear in the rightmost column accounts. As noted before, we do not show flows between the same level of government. Revenues raised by state and federal government from taxes on businesses and households appear in the state and federal (lower border) rows.

The local tax revenues raised within counties plus intergovernmental funds is total local government revenues (the row sum). Total revenues are spent by local governments on various programs. This spending appears as local government column entries. We disaggregate only education from other public goods and services because education spending is under school district authority.

The data on state expenditure by program is only available in terms of aggregate spending in the State. This data appears in the state column, program rows. The data source does not provide for the county distribution of these expenditures. The ultimate county distribution of the state spending is traced through the program accounts, then object spending across counties is distributed as explained below. Likewise, federal spending is shown as total spending on programs in the federal column, program row cells.

The money spent on the various programs covers salaries, purchases of goods and services, and sometimes transfers to different types of agents. The ideal matrix would show this separation

Table 4 Fiscal SAM

		Agriculture	Business	Commodity Market	Factor Market	Households	Local Government	*subtotal*	School Districts	Programs: State & Local Goverment Education	Programs: State & Local Goverment O. Public G & S	Programs: Federal Governm.	Programs: *Total Programs*	Objects: Salaries	Objects: Purchases	Objects: Tansfers	Objects: *Total Objects*	State	Federal	*Total*
	Agriculture						--	--	--	--	--	--	--			Transfers to Agric.				
	Business						--	--	--	--	--	--	--			Transf. To Businesses				
	Commodity Market						--	--	--	--	--	--	--		Purchases in County					
	Factor Market						--	--	--	--	--	--	--	Salaries to County Residents						
	Households						--	--	--	--	--	--	--			Transf. To Individuals				
	Local Government	Property & Other	Property & Other			Property & Other		Total Local Revenue from County		--	--	--	--					Intergov. Funds St. to Local	Intergov. Funds Fed to Local	
	Subtotal	Loc. Revenue Raised From Agriculture	Loc. Revenue Raised From Oth. Bsn.		Loc. Revenue Raised From Factors Mark.	Loc. Revenue Raised From Households		Total Local Revenue from County		--	--	--		Gov. Salaries Earned in County	Government Purchases in County	Government Transfers to County	Total Spendin g into Co.	Total Intergov. State to Local	Total Intergov. Fed. To Local	
	School Districts						School Dist. Revenue from County											Intergov. Funds State to Sch.D.	Intergov. Funds Fed. To distr.	
Programs	**Education**								Education Expenditures									State Educ. Expenditures	*	
Programs	**Other Public goods and Services**						Expenditures in Other Public Goods & Serv.											St. Other Programs expenditures	*	
Programs	*Total Programs*						Local Exp. in Other Public Goods & Serv.		Local Exp. in Education									Total State Direct Expenditure	Total Fed Direct Expenditure	
Objects	**Salaries & Wages**									Education Salaries St. & Loc.	Other Progr. Salaries St. & Loc.	Federal Salaries	Total Salaries paid within State							
Objects	**Purchases**									Education Purchases St. & Loc.	Other Progr. Purchases St. & Loc.	Federal Purchases	Total Purchases within State							
Objects	**Transfers**										Transf. St. & Loc.	Federal Transfers	Total Transfers within State							
Objects	*Total Objects*									Education Spending Within State	Other Progr. Spending within State	Total Federal Spend.ing within State	Total Gov. Expenditures within State							
	State Government	Sales & Corporate Income	Sales & Corporate Income			Charges & Individual Income		Total State Revenue from County												
	Federal Government	Corporate Income	Corporate Income		Social Sercurity	Individual Income		Total Federal Revenue from County											Intergov. Funds Fed. To State	
	Net Extraregional Transactions									Extrareg. Education Spending	Extrareg. Other Progr. Spending	Outside flow of Federal Spend.								
	Total	Total Rev. Raised from Agriculture	Total Rev. Raised from Businesses		Total Rev. Raised from Factors	Total Revenue Raised from Households		Total Revenue Raised from County		Total Education Expendit.	Total Other Programs Expendit.	Total Federal Expenditures	Total Program Spending							

Notes: (--) No entry here because we chose to show regional government spending in 'programs', and government spending within the region from 'objects'.
(*) Data not in this format (e.g. federal expenditures are not detailed by program).

for each program at each level of government.

We are able (due to data limitations) to present just a pooled account for these objects. This account presents data for the sum of state and local spending, distinguishing education from other public goods and services, and the sum of federal program spending. This pooled account shows the money spent within the state. To balance the 'program' account we use the 'net extraregional transactions' row that reflects the net flow of government salaries and purchases outside the state.

Finally, we allocate all government program spending on objects as revenues to farmers, businesses, workers, and households in each county; via subsidies, transfers, salaries, and purchases of commodities and services.

Information derived from SAMs

The fiscal SAM organizes all the available data on government tax receipts, intergovernmental transfers, and government expenditures relative to each region. Note that the full fiscal SAM of Iowa has 99 blocks and it is too large to be shown in hard copy. With this comprehensive and exhaustive set of regional fiscal accounts, we proceed to calculate county level measures of tax burdens and fiscal inflows. First, an (im)balance measure with respect to all levels of government is derived directly from the data in the matrix. Summing up the revenues collected by the three levels of governments from each type of taxpayer in the region measures all revenue raised from each region. (Refer to Table 4, the first five cells in the 'Total' row.) On the spending side, we sum all spending on objects within the region. This total represents the contributions by all levels of government to the economic activity of the region. (See Table 4, the first five cells in the 'Total Objects' column.) The net of these two totals is the final (im)balance in fiscal flows for each region.

Another indicator that can be calculated using the multi-regional fiscal SAM data (to our knowledge, not calculated before at the local level) is the 'fiscal effort index'. This index compares the actual revenue collected from local sources (6th. cell in 'Subtotal' column, Table 4) to the hypothetical revenue calculated outside the matrix (see the explanation in the literature review under 'Measuring Fiscal Performance', and Appendix III). Using the data in the fiscal SAM we can also calculate several other measures such as would indicate the proportion of program spending financed with state or federal transfers, or determine what type of taxpayer provides more government revenue at each level.

As described in the next chapter, I apply multivariate analysis to the indicators calculated using the data in the county-level matrix along with secondary data about the counties. The objective of the multivariate analysis is to identify patterns in fiscal situations associated with locations. The resulting groups are analyzed in next chapter. I have constructed a reduced fiscal SAM that aggregates the 99 Iowa counties into three regions. The three regions are urban counties, rural counties and all other Iowa counties. Appendix IV presents the complete three block matrix.

DATA ANALYSIS

In the previous chapter I explained the SAM used to organize the data on government revenue and expenditures by regions. I also explained how to derive some measures of fiscal balance-imbalance from these matrices.

The second objective of this thesis is to analyze the data, looking for patterns of fiscal situations that may differ across types of locations. Using the balance-imbalance measure and other information about county characteristics, I first performed a cluster analysis. Fiscal (im)balance for each county is calculated as the net per capita tax revenue to all levels of government from the county minus spending by all level of government received within the county. Second, using the groups resulting from that first step, I applied a stepwise procedure and discriminant analysis to complete the investigation.

Cluster Analysis

The basic objective of cluster analysis is to discover natural groupings of items. Cluster analysis is often thought of as a primitive technique in that no assumptions are made concerning possible group number or structure (Johnson and Wichern, 1992). It is basically an exploratory procedure aimed at simplifying complex multivariate relationships. In the widest sense, it is simply a method for organizing a large set of data so that information use may be more efficient. Describing patterns of similarity and differences among the individuals of a certain population by labeling their group is a convenient way to summarize data.

The objective of cluster analysis is to devise a scheme to sort objects into classes or groups so that *similar* ones are in the same group. The concept of similarity is defined in terms of the particular set of variables that is being used. Consequently, the chosen variables determine the frame for the clustering structure. The method is completely numerical and it is based on measures of similarities or distances (dissimilarities) between objects. Thus, one first important consideration is scaling of measured attributes. In this particular case I have used standardized variables.

Clustering Techniques

Many cluster algorithms exist that help to find 'reasonable' clusters without having to search for all possible combinations. The most widely used are the *agglomerative hierarchic* methods that start with each object in a group by itself. With this approach we have 99 initial clusters; one for each county. Based either in the original data set or in a matrix of distances (e.g. Euclidean, or Mahalanobis) the method begins to merge groups that are close together, repeating the procedure several times. Eventually, all subgroups are merged into a single cluster, but the analyst may decide where to stop. The procedure may be graphically represented by a dendrogram which illustrates the fusions made at each step.

Agglomerative hierarchic methods differ in the way they define 'similarity' or measured distance between individuals or groups. Some of these methods are:

i) *Single linkage*, defines distance between groups as that of the two closest pair of individuals.

ii) *Complete Linkage*, measures distance between groups as the distance between the two elements that are the farthest.

iii) *Average linkage*, defines the distance between two groups as the average of distances between all pairs of individuals.

iv) *Centroid*, measures distance between groups as the distance between the two mean vectors.

v) *Ward's minimum variance*. Formally, the procedure seeks to minimize the 'information loss' associated with each grouping. Information loss is defined in terms of error sum-of-squares:

$$W = \sum_i \sum_j (x_{ij} - \bar{x}_{i.})(x_{ij} - \bar{x}_{i.})' ,$$

where $\bar{x}_{i.} = 1/n_i \sum_i x_{ij}$ is the ith group mean vector, n_i is the size of the ith group and x_{ij} is the vector of attributes for the jth unit in the ith group. More intuitively, the procedure tries to minimize variance within groups (or maximize variance between groups). This method tends to form spherical clusters and groups of similar size.

Everitt (1993) presents an extensive summary of all advantages and disadvantages that have been found for each agglomerative technique. We may say that, among the hierarchical methods, *Ward's* and *average linkage* have been found to perform well. However, in general, no single method is 'best' for all situations. It depends always on the type of data, the objectives and the previous knowledge of the subject. In particular for our analysis, *Ward's minimum variance* seems to be the best.

One characteristic of hierarchical agglomerative methods is that once two objects have been joined they cannot be separated. Since eventually all objects can be aggregated, the investigator needs to decide when to stop. In other words, the final number of clusters is decided by the investigator not the algorithm. There are several criteria on which the analyst can rely to choose the number of clusters but one condition is really relevant: the groups have to be meaningful from the point of view of the original objectives. In this thesis: to highlight any possible pattern of fiscal situation by type of location.

Some formal criteria to choose the number of clusters are based on between and within sum of squares (Milligan and Cooper, 1985). One of them is the *Calinski and Harabasz index* (C_k) which is potentially non-linear and may reach a critical point. It is defined:

$$C_k = \frac{trace(B)/(k-1)}{trace(W)/(n-k)}$$

where B and W are the *between* and *within* cluster sum of squares and cross product matrices, (i.e. $B = \sum_i n_i(\overline{x}_{i.} - \overline{x}_{..})(\overline{x}_{i.} - \overline{x}_{..})'$ where $\overline{x}_{..} = 1/n \sum_i \sum_j x_{ij}$); k is the number of clusters and n is the total number of individuals. A C_k always increasing with k means no cluster structure, always decreasing as k increases is a sign of possible hierarchical structure. If C_k rises to a maximum at k^* and then decreases there are k^* clusters.

A second criterion used to determine the number of groups is the *'Cubic Clustering Criterion'* (CCC):

$$CCC = Log \frac{1-E(R^2)}{1-R^2} \cdot \frac{(np/2)^{1/2}}{(.001 + E(R^2))^{1.2}}$$

where R^2 is the same as trace(B)/trace(T), $(1-R^2)$ is trace(W)/trace(T), with T = B+W, and p is the rank of matrix B. Here the criterion is to stop clustering at the point that the CCC levels off as k increases.

Several other procedures may be used to confirm the results from a clustering. In many cases it may be reasonable to apply a number of clustering methods. Similar solutions may be a good sign that a particular structure is present. Another useful procedure to test results is to randomly divide data in subgroups and reapply the procedure. In this case, similar results suggest robustness of the stability of the solution. Finally, comparison of the clusters found, on the basis of other variables of interest is recommended (Everitt, 1993). If differences between clusters persist, it is a good sign that by using this structure we are conveying other useful information.

Cluster Results

Our goal is to identify patterns in fiscal situations. We start exploring the clustering power of different subsets of variables that include the fiscal (im)balance measure derived from the fiscal SAM data. The original set of variables includes the fiscal (im)balance measure and secondary information on the characteristics of each region. The characteristics of interest concern the county's rural population, farm types, some demographics, unemployment rates, average income, proportions of the work force that commutes and other variables. Appendix C shows the complete set of variables, sample means, and standard deviations.

Using SAS PROC CLUSTER, I found plausible results for various subsets, in the sense that they separate a reasonable number (less than 6) of meaningful groups. At the end I choose to show the results for a three-group clustering based on a subset of four variables. The four variables are: the per capita revenue minus spending measure of fiscal situation or fiscal balance (REV-SPD), the proportion of population living in rural areas (RPOP), proportion of farms with less than 50 acres (SFARM) and proportion of farms with more than 500 acres (LFARM). The inclusion of indicators of rural characteristics is motivated by the objective itself. The proportion of rural population is not enough. I also hoped to include some indicator of the farming activity in the area. The last two variables, rather than the simple number of farms, intends to reflect the type of farming activity that dominates. I found that the number of farms was (not surprisingly) positively correlated to less rural areas, and this obviously was due to the fact that, given the common size of Iowa counties, more means smaller farms. The farming area was not useful as a separation variable for similar reasons.

I used *Ward's minimum variance* method for structuring the groups. *Complete linkage* was also used as a checking procedure, and the final structure was very consistent. To determine the number of groups I looked at the *Calinski and Harabasz index* (pseudo F in SAS terminology) and the *Cubic Clustering Criterion*. Both of them coincide in a structure of about three groups.

At this point we must make a note: *Ward's* method tends to form spherical clusters with about the same number of individuals. Consequently, results are affected by outliers. Moreover, the two cut-off criteria cited above are known to perform well when group sizes are similar, which is not the case with my county level data. I found one large middle cluster and two smaller ones. Table 5 shows the sizes of the final groups in terms of population and number of counties.

Another way to check if the number of clusters is reasonable is to look at the RSQUARE. It represents a measure of the variability that is left outside the group. With three groups we have

Table 5 Population and Number of Counties by Cluster

	Cluster		
	1	2	3
Population	289639	923825	1563291
Counties	22	57	20

almost 50% of the variation outside, which is a reasonable result.

Group means for the four clustering variables are shown in table 6. The first group may be identified as the 'most rural', characterized by a large proportion of rural population (87% average), relatively more large farms (25% LFARM on average against 15% SFARM), which definitely receives more spending from the government than it pays in taxes and other charges (REV-SPD is negative).

Table 6 Means by Group (Cluster Variables)

Variable	Cluster		
	1	2	3
REV-SPD	-1428.82	69.67	520.15
RPOP	87.89	62.34	31.16
SFARM	14.83	16.41	24.39
LFARM	25.42	18.68	15.32

In the other extreme, there is group 3 that I would denote as 'most urban". This group has the smaller proportion of rural population (31% average) and relatively more small farms (24% SFARM average against 15% LFARM). On average the REV-SPD variable is positive and larger, implying that, in these counties, only part of what they pay in taxes returns to the county as government expenditures. This is not, however, a uniform characteristic of each county in the group; there is a wide variation and some of the most urban counties pay less taxes than they receive in spending.

The other group is what may be called an 'intermediate' group: average rural characteristics, and a small positive average for the REV-SPD indicator resulting from moderate negative and positive individual values.

Interestingly enough, the resulting groups make sense from the point of view of the traditional Beale classification. Beale Code (Figure 6) and Clusters maps for the 99 counties (Figure 7) give a first idea of the resemblance. The Beale Code, in a broad sense, classifies counties from metropolitan to non-metropolitan in nine steps. The nonmetro are subdivided into urban, less urbanized and rural, distinguishing adjacent and nonadjacent with respect to a metropolitan county (see Appendix VIII).

Table 7 Beale Code Composition of Clusters

Beale Code	Cluster			
	1	2	3	Total in Beale Code
2	1	0	4	5
3	0	0	5	5
4	0	0	3	3
5	0	2	4	6
6	4	17	3	24
7	2	33	1	36
8	3	5	0	8
9	12	0	0	12
Total in Cluster	22	57	20	99

Table 7 presents a crosstabulation of the counties between the three clusters and the original Beale code. It is apparent that Cluster 1 groups all rural nonadjacent counties, 3 rural adjacent and a few less urbanized. There is one special case included in the rural cluster that is in fact a metropolitan county: Pottawattamie.

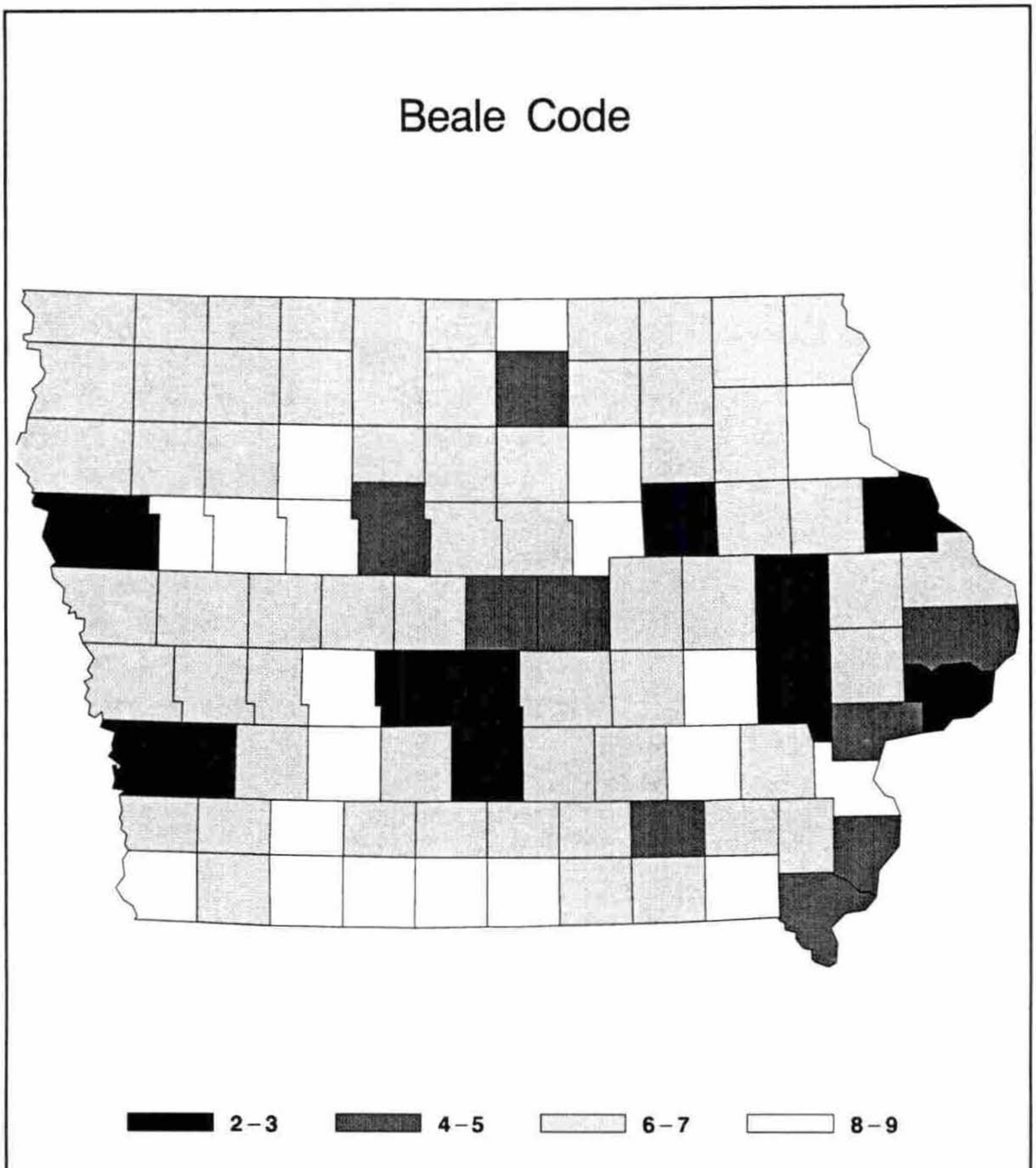

Figure 6 Iowa Counties by Beale Code Classification

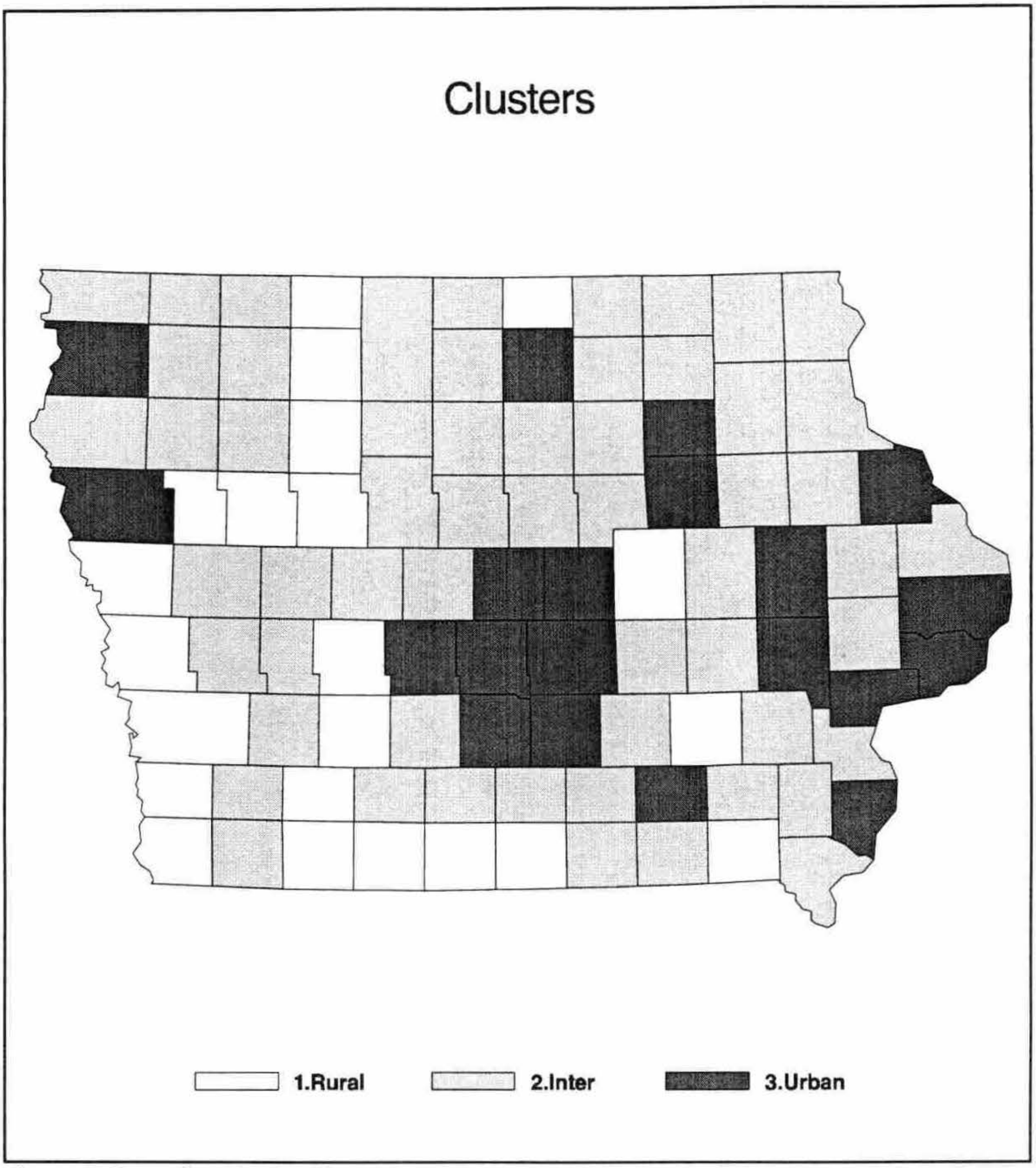

Figure 7 Iowa Counties by Cluster

This county is part of the Omaha MSA and is classified as metropolitan. Although the proportion of rural population is less than 30% in Pottawattamie, it has one of the largest negative revenue/spending observation. This difference comes from lower revenues raised relative to other similar counties combined with a larger spending in the county (particularly transfers from the federal government). Later, we'll see that this county is reassigned to the intermediate group (with high probability) by the discriminant analysis.

Cluster 2 combines most of the less urbanized counties, five rural adjacent and two urban nonadjacent: Lee and Webster. There are no special features about these counties other than a proportion of rural population a little over 35%, which stands a little over the urban proportion, and almost a tie between revenue generated and spending attracted.

Cluster 3 is mainly composed of metro and nonmetro-urban counties. There are 3 less urbanized adjacent and 1 less urbanized nonadjacent. As I said before, a few counties classified into this group present a negative fiscal balance (i.e., government expenditures larger than revenue), but contrary to what may be expected, these are none of the less urbanized. The 4 counties with negative balance measure are: Story, Clinton, Walpello and DesMoines. Both Walpello and Clinton county have a community college. The largest negative number is for Story county (even larger than the other 3 together), where education salaries play an important role. The less urbanized nonadjacent county classified in this group is Sioux which has the Northwest Iowa Technical College. Sioux county has consistent indicators of being rural (e.g., large proportion of rural population, large proportion of income coming from farming), except for a moderate high positive relation revenue/spending. Also, the proportion of small farms is much bigger than that of large ones (both characteristics of cluster 1).

Two other subsets of variables gave plausible results. The results were very similar to the three group solution described, but they produce a four group clustering with a split of the intermediate group. I decided for the three group because there was no important difference in the conclusions, not much additional information, and the interpretation of some cases was not clear.

This may not be the ideal cluster structure: other subsets of variables, other procedures or cut-off methods may provide better descriptions of the resulting groups. I have found, however, that the hypothesis that there are differences in fiscal situations related to the type of location appears consistent with the data. In fact, the usual tests leads to rejection of the hypothesis of equal means. I ran multivariate analysis of variance (MANOVA) to test the hypothesis of equal mean vectors between the three groups. The results point clearly towards rejection of the null hypothesis (Appendix VII). We are aware of the assumptions that MANOVA implies: normality and equal variances. We thought that the assumption of normality was not too restrictive since our data does not show any particular non-normalities. The assumption of equal variances is a bit more strong, and in fact, when we present "discriminant" results it is discussed more carefully. I also looked at the Bonferroni t-test for each pair of groups, and analysis of variance (ANOVA) for each variable in particular. Both tests supported the conclusion of significant differences between group means.

Discriminant Analysis

Discriminant analysis and classification techniques are usually associated because although they are aimed at different purposes, their purposes frequently overlap. Discriminant analysis is concerned with separating distinct sets of objects. Johnson and Wichern (1992) state the immediate goal of 'discrimination' is to describe, either graphically or algebraically, the differential features of objects from several known populations. The object of 'classification' is to sort or allocate objects (usually new observations) into two or more well defined classes. Discrimination is a procedure to find 'discriminants' that make populations as distinct as possible. Classification is about the construction of rules that can be used to assign new objects to predefined classes. They are, however, strongly connected, and in fact several discriminant procedures give 'good' rules for classification and vice-versa.

In this thesis I emphasize the separation aspect of discriminant analysis as a complement or corroboration of the clustering results. Like cluster, discriminant analysis is used here as an exploratory procedure. Actually, it is often used on an one-time basis to investigate group differences when causality or interrelationships are not apparent.

Discrimination Techniques

Discriminant analysis is also a method completely numerical and intends to consider distances of individual observations from the population means as well as variability. Formally, these populations can be described by probability density functions. For a two population case, observations can be assigned to populations by looking at the results of a likelihood ratio of the form: $L(1)/L(2)$, where $L(i)$ $i=1,2$ is the likelihood function or joint probability density function evaluated at the corresponding sample.

Depending on the assumptions that the investigator is able to make, the likelihood ratio test will generate a quadratic or a linear function. In particular, departures from normality affect seriously the validity of a quadratic rule but it is less crucial for a linear rule. On the other hand, the linear function requires the assumption of homogeneity of variances (i.e., compares distances from means), while non homogeneous variances are accommodated with a quadratic function.

The linear function has proven to be a good rule when the distribution is not normal with equal variances. Also, the linear function has the advantages of simplicity and easier interpretation. Thus, this rule is very popular for identifying characteristics of various sub-populations. Linear functions are also known as *'Fisher discriminant functions'*. The intuition behind Fisher's work is easy to understand and especially helpful for separation objectives. Fisher's idea (Johnson and Wichern, 1993) was to transform multivariate observations into well-separated univariate observations. The discriminant analysis should provide reasonable representations of the populations using only a few linear combinations of the original variables. A simple version of the problem is to find $Z = \underline{\beta}'\underline{X}$, where $\underline{X}$ is the vector of original variables and $\underline{\beta}$ is the vector of coefficients. The point is to find the coefficients that maximize distance between groups. This is done by maximizing squared distance between sample means of Z over the sample variance of Z. It can be shown that the vector of coefficients that most separates the groups is given by the first eigenvector (i.e., the eigenvector associated to the largest eigenvalue) of the matrix $W^{-1} \cdot B$, where B and W are defined as before. In a way, this is consistent with the purpose of maximizing the group separation which can be measured by the ratio of 'between' over 'within' variances.

The usual way of judging the performance of any rule is related to its classification objective. Ideally, we could use population density functions to evaluate error rates. Since many population parameters appearing in the discriminant functions are likely to be estimated from the sample and density functions which are hardly known, I must use some substitute of the ideal procedure. To measure the performance independently of parent populations, I can calculate 'error rates' or misclassification probabilities by reapplying the rule to the original observations. There are several methods for estimating the sample rule performance. One of these methods is called 'resubstitution' or the *apparent error rate* (APER). The error rate is defined as the fraction of observations in the training sample that are misclassified by the sample discriminant function (Johnson and Wichern, 1993). The APER is calculated from a matrix that combines original and predicted group membership. Table 8 is a sample of this matrix for the two population case, where n_{ij} represent

Table 8 Misclassification Error

	Predicted		
Origin	Pop 1	Pop 2	Total
Pop1	n_{11}	n_{12}	n_1
Pop2	n_{21}	n_{22}	n_2

number of observations coming from population i classified into population j (i,j =1,2).

Then, APER = $(n_{12} + n_{21})/(n_1 + n_2)$ is recognized as the proportion of items in the original sample that are misclassified.

Another way to estimate error rates consists in setting aside a certain number of observations, constructing the rule from the rest, and then using the group set aside to check the results. The method known as *'crossvalidation'* uses this idea. The basic idea is to randomly separate the sample in g groups, then construct the rule from g-1 groups and test it with the elements of the g^{th} group. Repeat this procedure g times, recording the results each time. Finally, construct a table, like the one explained above, using these results and calculate the error rate in the same way. One variation of this method is to 'holdout' one element at a time (i.e. groups of one element). This is known as *Lachenbruch's procedure*.

All these methods provide biased estimates of the true misclassification rates, unless the sample sizes are very large. Crossvalidation provides less biased estimators than resubstitution. However, these problems affect classification more than separation because the estimated classification rule tends to be better at separating the training samples than distinguishing among the underlying populations.

Finally, as in clustering, there is the problem of which variables to use. Apparent error rates from resubstitution will not increase as more variables are included in the classification rule but probabilities of misclassifying a new case may increase. In any case, it is desirable to select a relatively small subset of variables that ideally contains as much information as the original set.

To work with linear discriminant functions, the *stepwise discriminant analysis* is an appropriate tool to select a significant subset of variables. The objective of stepwise discriminant analysis is to produce a good discrimination model using 'stepwise' selection of variables. The model building process starts with no variables and then tests one at a time to enter the model. After a new variable is entered, the preceding variables are checked to see if they are still significant. The selection and removal of variables is usually based on an F test (both for entry and removal purposes), used by SAS and BMDP packages, but there exist other statistics to perform the test. The F test involves an analysis of covariances where the new variable is regressed against the ones already in the model.

The procedure is sensitive to the presence of large correlations among variables or combinations of variables. Because the procedure does not account for correlation between variables that have not been entered in the model, some important variables may be excluded. However, it has proven to be successful in selecting correct variables in a number of cases; in particular, when the sample size is less than or equal to 100 (O'Gorman and Woolson, 1991) as in this study.

Discriminant Results

The construction of a discriminant rule based on the same subset of variables chosen for clustering is usually a first check on the grouping of individual observations. One expects to find very few reassignments and small error rates. In our case, the estimated error rates were between 3% and 4%, according to the method used.

A further use of discriminant analysis is to consider a larger set of attributes and see how well they discriminate into the predefined clusters. Finding that extra variables behave differently for the predefined groups, is one way to be more confident about the chosen clustering and it also help the description or characterization of the groups.

I first applied stepwise discriminant analysis (SAS PROC STEPDISC) to the same original set of variables described for clustering, to select a meaningful subset. Four new variables were chosen as significant, apart from the four originally used for cluster: fiscal effort index, either relative to state (SFEFF) or to the whole U.S.A (NFEFF) , percentage of work-force commuting out (COMOUT), percentage of total personal income from farming (FARMINC), and the local unemployment rate (UNEMP) (Appendix D). A significance level of 25% was used, which may be considered conservative. The unemployment rate was the less significant variable, it does not differentiate among groups very much.

Then I used discriminant analysis to construct a linear discriminant rule (SAS PROC DISCRIM). I used a linear function, even though the homogeneity of variances would be rejected using the standard test (Chi-square test for homogeneity of within group variances). The use of a linear function, as I argued before, has the main advantage of direct interpretation of the results. Also, the estimated error rate using a quadratic rule (not pooled variance), does not improve much the results of a linear rule: 2% and 8% from resubstitution and crossvalidation respectively.

Discriminating among the three clusters with a linear function and eight variables performed well and resulted in acceptable error rates. The resubstitution method shows an apparent error rate of 1% (as noted before it decreases as more variables are included), and crossvalidation estimates of the probability of misclassification was an overall 7%. Even though our final goal is separation for descriptive purposes, rather than classification, I choose to show the crossvalidation results (see Table 9) because it provides more information. The SAS printout shows the elements that are considered misclassified individually, and gives the probabilities of belonging to every possible group (Appendix VI).

Table 9 Crossvalidation Summary.

	To Cluster			
From	1	2	3	Tot
1	18	4	0	22
2	2	55	0	57
3	0	1	19	20
Tot	20	60	19	99

Total Error estimate: 7% (4+2+1/99 = .0707)

Most of the changes would be between groups 1 and 2. There is one county going from the most urban to the intermediate group, but the probability of being in either group is very close to 50%. There is one change worth mentioning: Pottawattamie is moved from group 1 to 2, with probability larger than 80%.

The three group structure is thus supported by the eight variable discriminant analysis. Characterization of clusters may be completed by referring to the group behavior of the new variables. Table 10 presents the group means for the eight discriminant variables. As mentioned earlier, unemployment rate does not account for much variability itself, so comments are restricted

Table 10 Means by Cluster (Discriminant Variables)

Variable	Cluster		
	1	2	3
REV-SPD	-1428.82	69.67	520.15
RPOP	87.89	62.34	31.17
SFARM	14.83	16.41	24.39
LFARM	25.42	18.68	15.32
SFEFF	101.23	119.30	112.60
COMOUT	28.23	21.53	17.54
FARMINC	7.03	6.95	2.06
UNEMP	2.35	2.51	2.47

to three of these new variables.

Cluster 1, identified as the most rural with a large government expenditure relative to revenue raised, is characterized by a higher proportion of farm income (FARMINC 7.03% on average). This group is also distinguished by the lowest fiscal effort indexes (SFEFF is 101.23% on average), and the highest percentages of out-commuting (average COMOUT is 28.23%). Even though discriminant analysis results suggest changing Pottawattamie from this group to the intermediate group, more than 40% of its labor force commute outside the county, and probably outside the state (i.e. Omaha), since it also has one of the largest proportions of workers in the service area (near 60%). Fiscal effort indexes for this county are also moderate (about 101%).

Cluster 2, the intermediate group, displays much more variation in income generated on farms, even though the group average is very similar to that of the first group. The proportion of work-force commuting out is lower than in group 1 and has a larger variation. Finally, this is the group with highest relative level of fiscal effort.

Cluster 3, the most urban, shows very small proportion of income coming from farming, except for Sioux county which is maintained by discriminant analysis as part of this cluster. The proportion of out-commuting is the lowest with the exceptions of Dallas and Warren counties, both adjacent to Polk county. Fiscal effort indexes are average relative to the state.

MANOVA tests for comparison between mean vectors were also used here (Appendix VII). Again the results support the alternative hypothesis of significant differences between the 3 groups. The ANOVA results are, in general, consistent except for the 'unemployment' variable where it is not possible to reject the equality hypothesis, and that of 'fiscal effort' where the result is on the borderline. This should not be any trouble. First, we are working with multivariate analysis and ANOVA is just testing isolated variables. Second, we already notice the unclear behavior of 'unemployment' and pointed out that it was the variable that contributed the least to the discrimination.

Three-Region Fiscal SAM

The three-block SAM constructed with this clustering (Appendix IV) provides some interesting details. Individuals are the most significant source of revenue in any type of region and at any level of government. More than 50% of total burden in each region (table 11) comes from households (e.g.: individual income and property taxes), and another 20% are from social security contributions.

Table 11 Share of Total Burden by Group and Cluster (%).

Cluster	Group			
	Ag	Busin	Factor	H-H
1	6	18	20	55
2	6	20	18	56
3	1	27	20	52

Focusing on local revenues, I should note that the farm sector bears almost 30% of the burden. In contrast, in the most urban counties, the farm sector bears only about 5% of local taxes raised. About 20% of the total tax burden is levied by local governments (mostly property taxes), and more than 50% by the federal government.

The pattern of dependence on intergovernmental transfers shows some group differences (table 12). Approximately 36% of spending on programs (excluding education) in rural counties is supported by transfers, while for the most urban group, state and federal transfers account for about

Table 12 Revenue by Source and Cluster (%)

Cluster	Source	
	Own Source	Intergov Transfer
1	64	36
2	70	30
3	77	23

23% of their resources.

From the point of view of income-generating government spending, group differences are more striking (table 13). The three groups identified show differences in patterns of expenditures on objects earned as revenue in each type of county. Most of government spending is on transfers for any cluster. For counties in the most rural group, transfers account for a much large proportion (68%) of the total spending, compared to the other two types of regions. Individuals are the primary target of transfers in all regions, but I should note that transfers to the farm sector explain almost 30% of the transfers received in the most rural group, against 10% in the most urban one. Object spending coming into the most urban group is distributed more evenly between purchases of goods and services, salaries and transfers.

Table 13 Expenditures by Object and Cluster (%).

Cluster	Object		
	Purchases	Salaries	Transfers
1	10	22	68
2	14	27	59
3	26	32	47

In summary, there is evidence to support the hypothesis of different fiscal 'behavior' by type of location. There are two well differentiated groups: one group includes the most rural counties (in the traditional sense) with larger government spending levels relative to revenue, explained by the high proportion of transfers, in particular to the farm sector. This cluster also displays lower fiscal effort and a higher proportion of grants from state and federal government. A considerable part of their work-force commutes out. The second group includes the most urban counties where revenue raised from county businesses and residents exceeds government spending received as income by the cited agents. These urban counties also display average fiscal effort indexes and a large part of work-force is resident. Almost 80% of the government spending in the area (other than education) is financed by own sources. Object composition of government spending in the urban area is homogeneous.

Finally, a third and the largest group of counties includes some rural and urban features. These counties maintain only small fiscal imbalances, have an intermediate proportion of their work-force commuting out, and make the largest fiscal efforts.

Figure 8 plots the revenue/spending balance against the proportion of rural population. Figure 9 plots the revenue/spending balance against the fiscal effort index; and Figure 10 plots again the revenue-spending results against the proportion of work-force commuting out. Even though some overlapping occurs we can appreciate the differences between the three groups. In particular, the cluster of most rural counties appears quite well defined by lower taxes than government spending, lower fiscal effort, and a larger proportion of out-commuters.

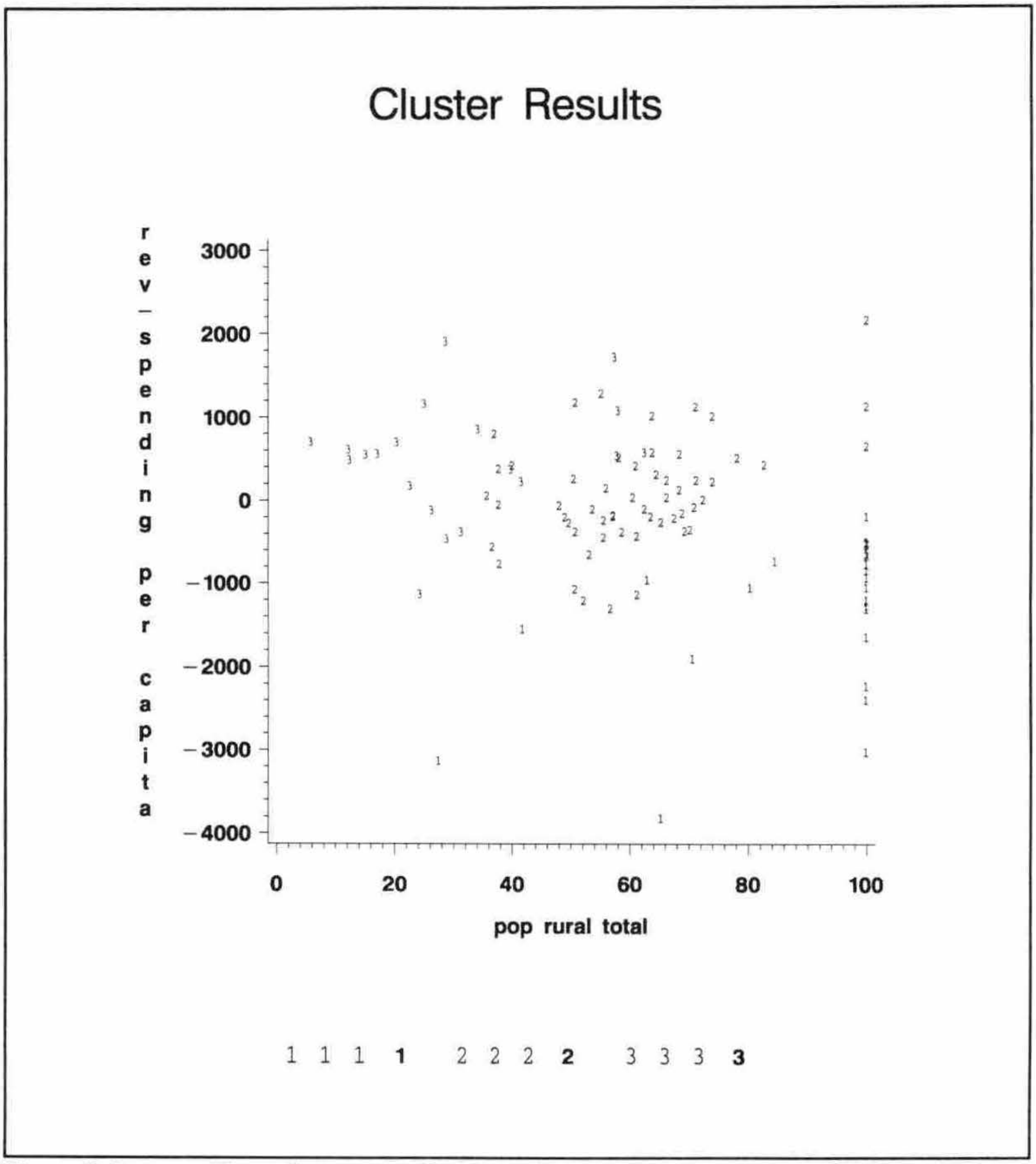

Figure 8 Revenue-Expenditure versus Rural Population

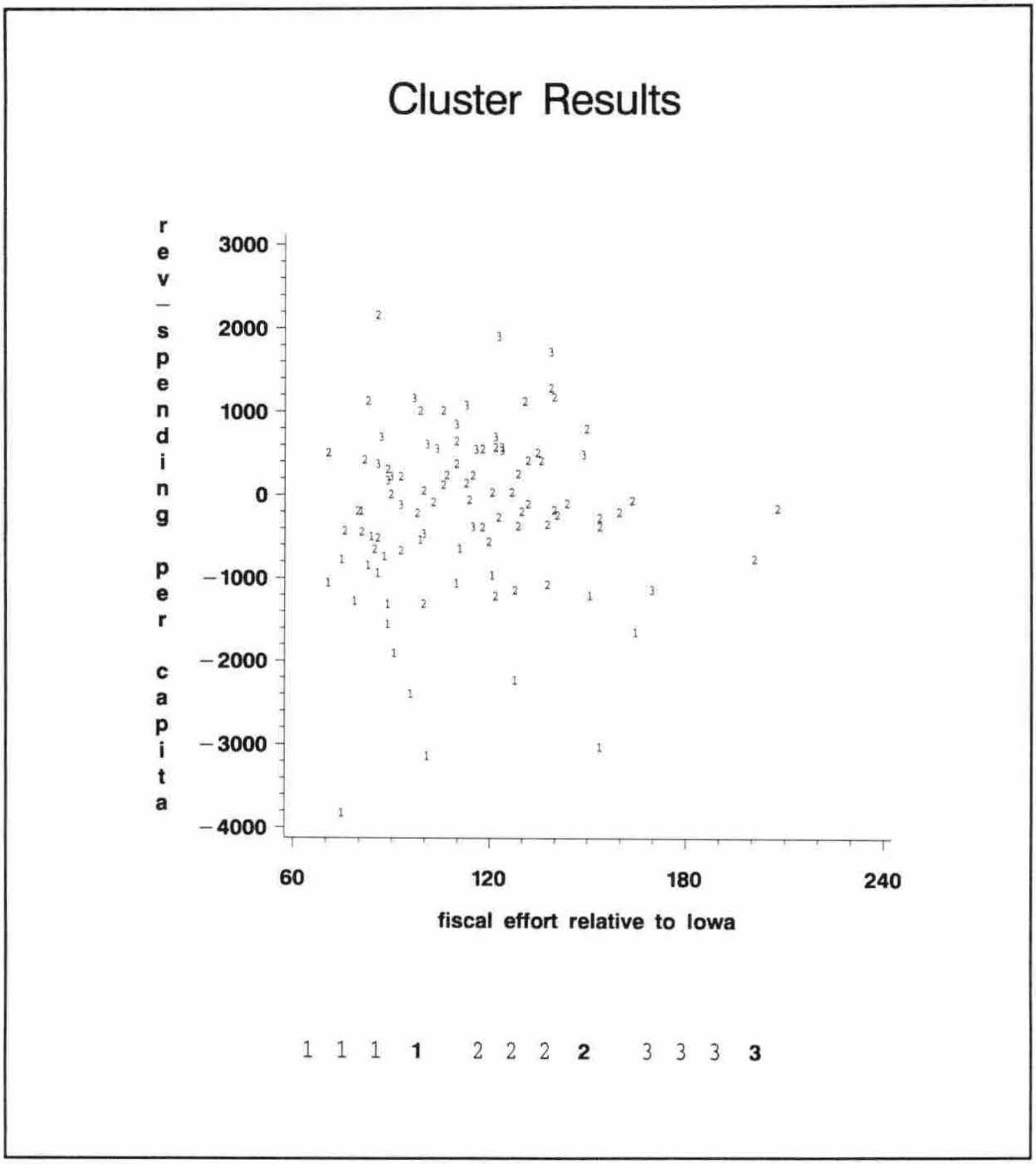

Figure 9 Revenue-Expenditure versus Fiscal Effort

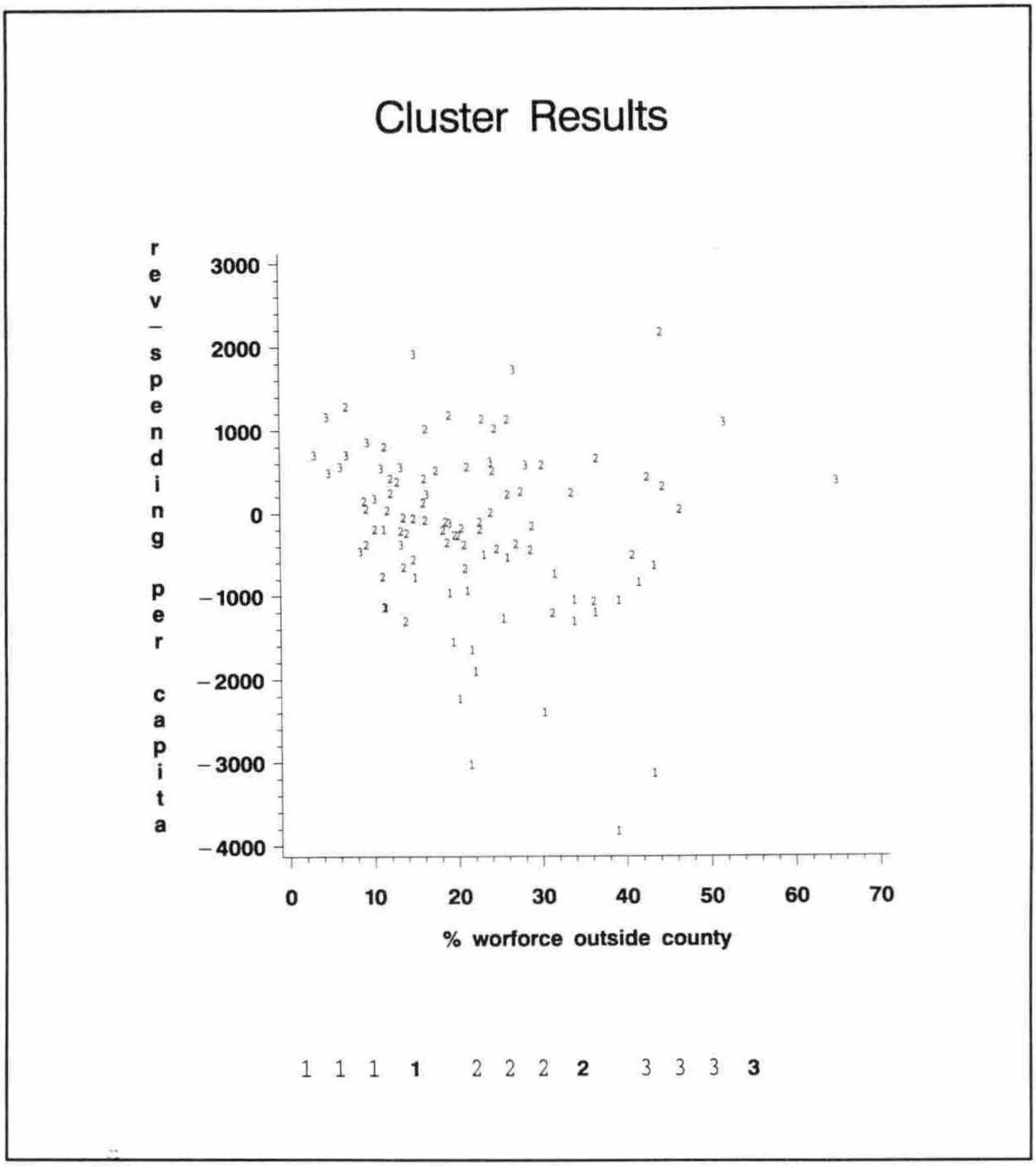

Figure 10 Revenue-Expenditure versus Out-commuting

CONCLUSIONS

Under the system of *fiscal federalism* in the United States, local governments have depended on intergovernmental transfers for about 40% of their total revenues, and states have depended on intergovernmental transfers from the federal level for about 20% of their total revenues (Mills and Hamilton, 1995). The higher levels of government have pooled taxes from individuals and businesses across locations and have provided intergovernmental transfers to distribute public goods and services more evenly across the country. Recent proposals to give states more authority over public good provision may significantly alter this redistributive mechanism. The form and level of intergovernmental transfers to local levels, as well as local tax and spending authorities, are also expected to change. What differential effects might these changes have on rural versus urban communities?

This thesis concerns the vertical and horizontal fiscal relationships between governments and localities. One set of vertical relationships is tax collection by federal, state, and local authorities from economic entities and households in each location. Another set of vertical relationships is government spending on programs, on transfer payments or salaries to households, and on purchases of goods and services from economic entities, in each location. The differences between rural and urban locations in these taxing and spending patterns are the main horizontal relationships of interest in this thesis. Other horizontal relationships investigated include the allocation of government expenditures across objects, and the distribution of tax burdens across economic agents within locations. I organized data on fiscal flows to and from the ninety-nine counties of the State of Iowa to empirically investigate potentially significant differences between rural and urban areas in these vertical and horizontal relationships.

From a review of the public finance literature, it is clear that the *Tiebout Hypothesis* is the basis of most models of taxes and public good provision. In sum, the Tiebout Hypothesis is that citizens migrate to jurisdictions that offer the tax/public good package they prefer, given their constraints. For empirical analyses such as forecasting local government expenditure, citizen preferences and constraints are instrumented by local socio-economic characteristics such as income, ethnicity, employment status, levels of urbanization, and land area. These models fit the data reasonably well and encourage one to seek further evidence against a null hypothesis that rural and urban fiscal patterns are alike.

Unfortunately, the available data on taxing and government spending are not presented in a way that facilitates this kind of vertical and horizontal comparison. An analyst can easily obtain data on federal taxing and spending, or, state taxing and spending, by location. But there is no presentation of the complete set of data on all taxes paid from a location to all levels of government that is reconciled with all spending allocated by all levels of government, by local areas. Thus, the first task of this thesis was to design and to construct such a comprehensive set of fiscal accounts.

The *fiscal social accounting matrix* (fiscal SAM) shows who pays what taxes to whom and how this revenue is spent. The *multijurisdictional fiscal SAM* presents local, state and federal flows simultaneously. Furthermore, the *multi-regional, multi-jurisdictional fiscal SAM* presents the same data across local jurisdictions simultaneously to facilitate interregional comparisons. Finally, the accounting and balance conventions of social account construction guarantee that local fiscal account data is comprehensive and fully reconciled.

The fiscal SAM developed in the previous chapters shows who pays what to whom since revenue collected by each level of government is shown by type of taxpayer. In the matrix, payments from each agent type (i.e., farm business, other business, factors of production, or households) to each level of government (local, state and federal) are distinguished since the fiscal transactions of each type of agent are recorded in distinct row/column account entries. The fiscal SAM matrix also helps highlight how money is allocated by each level of government across programs or as intergovernmental transfers.

In particular, the proposed fiscal SAM structure hypothetically differentiates intergovernmental grants by type: lump sum, block, matching, or categorical (if there were data to distinguish government program spending according to type). It is proposed that the concept 'intergovernmental transfer' should be used to refer specifically to lump-sum or block granting, to distinguish such spending from categorical or matching grants. These distinctions could be made obvious in the proposed fiscal SAM. Matching or categorical would be recorded as an expenditure from higher levels of government directly into programs. This direct articulation would signify that the higher level of government has authority over the way the program funds are to be spent. Lump-sum transfers would be recorded as expenditures from higher levels of government to lower levels of government. The lack of program articulation would signify the lack of higher level authority over how the intergovernmental transfers would be spent.

Moreover, the fiscal SAM developed in this thesis carefully traces actual government spending to locations. The fiscal SAM distinguishes government program accounts that pool local tax revenues and intergovernmental transfers to finance the provision of the public good or service. This fiscal SAM innovation also facilitates accounting for programs which are jointly administered by jurisdictions that are not necessarily vertically *coherent* across space. For example, education spending is administered through school districts whose boundaries are not necessarily contiguous with county or municipality boundaries.

Given revenues for government programs, program spending is on objects: goods and services, salaries and wages, and transfers to industries and people. In the *multi-regional fiscal SAM*, object spending is carefully allocated across local areas according to side information about the location of economic activity by industry, the locations of transfer recipients, and the residential locations of government employees across space. The traditional approach is to measure burdens by counting taxes paid from, and to measure benefits by counting program expenditures targeted to, the community. The traditional approach does a very poor job of accounting for the effects of government spending on local area income, since neither goods/services nor government employees are all supplied by the region for which they are demanded. This confounding of cost-priced local benefits with government spending flowing to localities can lead to serious errors in fiscal impact modelling, since total government expenditure accounts for over 40% of U.S. GNP.

In sum, the *multi-regional, multi-jurisdictional fiscal SAM* approach to government accounts guarantees that the data on local fiscal flows is comprehensive and consistent, especially across jurisdictions. Constructing the fiscal SAM is thus an important first step before attempting to compare fiscal situations of one location with another. I used the latest data (unpublished/unreleased) provided on tape exclusively for this thesis from the U.S. Census of Governments to create county-level fiscal SAMs for each of the ninety-nine counties in Iowa for the year 1992. In the next step I investigated whether fiscal patterns varied by type of location.

First, I applied cluster techniques to group the ninety-nine counties by type. The cluster variables included data reflecting ruralness (proportion of population residing in towns of less than

2,000), farming characteristics, fiscal (im)balance, unemployment rates, demographics, and the proportions of out-commuters. The results of both cluster and discriminant analysis of the Iowa county data indicated that a three group structure was robust. This objective analysis showed Iowa counties can be classified as Rural, intermediate, or Urban types.

Next I compared fiscal characteristics across the cluster groups. From the review of the literature, three ways to measure equity were identified. First was *horizontal equity* (equal treatment of equals); second was *vertical equity* (tax according to ability, benefits according to need), and a third referred to benefits going to those who bear the burdens. Measures of *fiscal capacity* and *fiscal effort* were also described. How do these fiscal measures vary across Iowa counties by cluster type? Do farmers bear a disproportionate tax burden through the property taxes they pay? Do urban areas depend disproportionately on intergovernmental transfers financed by taxes from other areas? Are counties whose residents commute out to work different, fiscally, than other counties?

Iowa is a fiscally responsible state, on average. It's counties are more self-sufficient than the average U.S. county. The rural counties receive 36% of the total revenues from intergovernmental sources, compared to the U.S. average of 40%. Only 23% of the total revenue for Iowa's urban counties comes through intergovernmental flows. Furthermore, Iowa's *fiscal effort* is above average compared to the other 49 states (ACIR).

From the cluster and discriminant analysis it is clear that Iowa's rural counties enjoy a larger government expenditure inflow than they bear tax burden. Counties with the most rural characteristics, and in particular, more larger farms, attract more government spending compared to the revenue they generate. It is true that farm property taxes are an important part of the local fiscal burden, but it is also true that federal transfers to agriculture are a significant part of the fiscal inflows into the localities. When *all* government fiscal flows are considered, we cannot say that farmers bear a disproportionate burden. As federal spending on transfers to farmers changes under the new farm bill of 1996 ("Freedom to Farm"), however, this surplus of fiscal inflows over outflows may disappear.

In contrast, the most urbanized counties relied the least on intergovernmental transfers (23% compared to rural's 36%) and were the most self-sufficient. The most urbanized counties also bear a larger tax burden compared to the government spending they receive as income. Per capita, urban residents generated over $500 more tax revenue, on average, than was earned in urban counties through government expenditures. Households in urban (as well as all other areas), bear well over half the total tax burden in the form of personal income taxes. Non-farm urban businesses bear the local tax burden, and the largest component of local government revenues is property taxes. The proposition that Iowa's urban areas receive a disproportionately larger benefit (per capita) from government is not supported by these analyses.

Counties of the intermediate type display relatively balanced tax outflows/fiscal inflows. They also displayed the highest level of fiscal effort among the three types of counties in Iowa. The property tax burdens are more evenly shared by farm and non-farm businesses, and object spending into these counties includes less on transfers to farmers. There is no evidence that urban communities in Iowa are being subsidized by the other types of communities.

The discriminant analysis also showed that county fiscal situations differed according to the proportion of out-commuters relative to the resident labor force. Over 28% of the labor force residing in the most rural counties commutes out (on average); and these counties paid over $1,400 less per capita in taxes than they received through government spending. Over 21% of the intermediate type county labor force commutes out (on average); and these counties generated about the same amount of tax revenue as they received through government spending.

In sum, the cluster and discriminant analysis of the multi-regional, multi-jurisdiction fiscal SAM data on Iowa counties provides some evidence against the hypothesis that Iowa farmers bear disproportionate tax burdens, and against the hypothesis that urban areas are more dependent upon federal transfers than other areas. Such results would likely not be revealed if traditional fiscal accounting approaches were employed. According to the traditional approach, government expenditures are reported across programs, across objects by category, and across locations for direct transfers to persons. But there is no comprehensive account of all government spending (not just transfers to persons) across supplying locations of goods, services, or government employees. The allocation of program spending across locations is traditionally estimated according to population shares. This is obviously not appropriate for allocating, for example, federal military spending; and there is no reason to presume that the traditional way would be appropriate for tracing any government spending or wage/salary payments. The fiscal SAM approach developed in this thesis is a methodological improvement.

Finally, some topics for further work emerge clearly. First, we need more and better data. We would like detail about the nature of federal grants to state and local governments to be able to analyze how changes in the form of intergovernmental transfers may affect local area fiscal (im)balances. We also need data on local-local fiscal interrelations before we can present a complete picture of the horizontal fiscal relationships among jurisdictions. Second, we would like to analyze the fiscal SAM data in other ways, calculating, for example, more detailed measures to investigate vertical equity. We would like to conduct SAM multiplier analyses using fiscal SAMs with intergovernmental transfers correctly and fully distinguished by type (block vs. categorical). Third, other multivariate statistical analyses should be conducted to better understand the relationships between local area characteristics and local area fiscal situations. One could estimate multinomial probit models of fiscal (im)balance as related to jurisdictional characteristics.

APPENDIX I: THE REGIONAL GOVERNMENT ACCOUNTS

	Local and special districts			State			Federal			Total		
	Region	Rest of world	Total	Region	Rest of World	Total	Region	Rest of World	Total	Region	Rest of world	Total
I. General Government												
Current Account												
A. Expenditure												
1. National Security												
2. Public Safety												
3. Highways												
4. Education												
5. Public Welfare												
6. Health and hosp.												
7. Other												
Total												
B. Revenue												
1. Income Taxes												
2. General sales Taxes												
3. Property taxes												
4. Other												
Total												
C. Surplus or deficit												
current account												
(A - B.)												
II. General Government												
Capital Account												
A. Expenditure												
1. National security												
2. Public Safety												
3. Highways												
4. Education												
5. Public Welfare												
6. Health and hospitals												
7. Other												
B. Revenue												
1. Borrowing												
2. Other												
C. Surplus or deficit												
capital account												
(A - B)												
III. Public Enterprise												
Current Account												
A. Expenditure												
1. Wages and salaries												
2. Other goods and serv.												
3. Other												

Total												
B. Revenue												
1. Sales of goods and serv.												
2. Other												
Total												
C. Surplus or deficit												
on current account												
(A - B)												
IV. Public Enterprise												
Capital Account												
A. Expenditure												
1. Buildings and other												
construction												
2. Machinery and												
equipment												
3. Other												
Total:expenditures												
B. Revenue												
1. Depreciation												
allowances												
2. Other												
Total												
C. Surplus or deficit on												
capital account												
(A - B)												
V. Trust Fund Current												
Account												
A. Expenditure												
1. Administrative												
expenses												
2. Transfers or pay-												
ments to												
beneficiaries												
Total												
B. Revenue												
1. Employer taxes												
2. Employee taxes												
3. Interest												
Total												
C. Surplus or deficit on												
current account												
(A - B)												

APPENDIX II: SAM SAMPLES

IIa. A SAM for U.S.A.

UNITED STATES macro SAM from NIPA
1987 Billions of Dollars

RECEIPTS OR INCOME	EXPENDITURES OR OUTLAYS: 1 Com-modity	2 Activity	3 Value added	4 Indirect taxes	5 Employee compensation	6 Proprietor income	7 Property income	8 Statistical discrepancy	9 Enterprise	10 House-hold	11 Govern-ment	12 Capital account	13 Rest of world
1 Commodity		0								3012.06	924.78	712.91	428.05
2 Activity	4526.69												
3 Value added		4160.38											
4 Indirect tax		366.30											
GNP		4526.68											
5 Employee compensation			2683.40										
6 Proprietors			312.95										
7 Property			682.35										
National income			3678.70										
8 Statistical discrepancy		0.02	-8.13							-0.11	0.05	-0.03	0.08
9 Enterprise			489.80			312.95	682.35			92.10	92.65		
10 Household					2284.28				975.05		520.63		
11 Government				366.30	399.13				133.78	570.35			
12 Capital account					0.00			-8.13	561.03	104.23	-104.83		
13 Rest of world	551.10									1.33	36.28	-160.58	
Column totals	5077.79	4526.69	4160.38	366.30	2683.40	312.95	682.35	-8.13	1669.85	3779.95	1469.55	552.30	428.13

IIb. <u>Bi-regional SAM for Malaysia</u> (Pyatt and Round, 1985)

Aggregate Regional Accounts for East and West Malaysia, 1970

(in millions of Malaysian dollars)

			Expenditures: East Malaysia: Wants	East Malaysia: Factors	East Malaysia: Institutions' Current: Households	East Malaysia: Institutions' Current: Companies	East Malaysia: Institutions' Current: Government	East Malaysia: Combined Capital	East Malaysia: Commodities	East Malaysia: Activities	East Malaysia: Indirect Taxes	West Malaysia: Wants	West Malaysia: Factors	West Malaysia: Institutions' Current: Households	West Malaysia: Institutions' Current: Companies	West Malaysia: Institutions' Current: Government	West Malaysia: Combined Capital	West Malaysia: Commodities	West Malaysia: Activities	West Malaysia: Indirect Taxes	Rest of World: Current	Rest of World: Capital	Total
Incomes			1	2	3	4	5	6	9	10	11	1	2	3	4	5	6	9	10	11	7*	8*	
East Malaysia	Wants	1			1179.0																		1179.0
East Malaysia	Factors	2								1563.0			.0								12.0		1575.8
East Malaysia	Institutions': Households	3		1376.0	74.2	10.9	25.0							0									1486.1
East Malaysia	Institutions': Companies	4		149.0			7.8								0						3.2		160.0
East Malaysia	Institutions': Government	5			36.1	32.5					253.0					226.6					2.2		330.4
East Malaysia	Consolidated Capital	6			196.8	106.6	36.8										93.8						434.0
East Malaysia	Commodities	9	1179.0				243.0	349.0		1421.9								98.1			1211.8		4302.8
East Malaysia	Activities	10							3108.7														3108.7
East Malaysia	Indirect Taxes	11							129.2	123.8													253.0
West Malaysia	Wants	1												6349.2									6349.2
West Malaysia	Factors	2		•															9038.1		219.4		9257.5
West Malaysia	Institutions': Households	3			•								7319.7	401.7	98.0	171.2					16.0		8006.6
West Malaysia	Institutions': Companies	4				•							1401.9			125.9					11.9		1539.7
West Malaysia	Institutions': Government	5					235.0							351.9	959.1					1549.0	12.9		3107.9
West Malaysia	Consolidated Capital	6						•						903.8	262.5	818.6						-85.0	1899.9
West Malaysia	Commodities	9							218.2			6349.2				1742.0	2014.9		7891.3		4111.8		22327.4
West Malaysia	Activities	10																17296.1					17296.1
West Malaysia	Indirect Taxes	11																1182.3	366.7				1549.0
Rest of World	Current	7*		50.8		10.0	2.8		1046.7				535.9		220.1	23.6		3730.9					3640.8
Rest of World	Capital	8*						85.0									-208.8				38.8		-85.0
Total			1179.0	1575.8	1486.1	160.0	330.4	434.0	4302.8	3108.7	253.0	6349.2	9257.5	8006.6	1539.7	3107.9	1899.9	22327.4	17296.1	1549.0	3640.8	-85.0	

APPENDIX III: SAM DATA SOURCES AND METHODOLOGY

I) Sources

Local and State Governments

The main source for local and state revenues and expenditures is the 1992 Census of Government (CG92) Finance Statistics, Individual Unit Records (file 92GOVFIN1). The totals were always checked with the information from Government Finances 1991-92 (U.S. Department of Commerce,Bureau of the Census, 1995) table 29: State and Local Government Revenue and Expenditure by Level and Type of Government, by State.

1) Local governments

i) Revenues

First, a total of property taxes collected by county was constructed from CG92. There is data directly for the taxes collected by local governments not including schools. We used that structure to distribute the total collected by schools. We think that the underlying property structure may be reflected in this way. The common approximations have been to use enrollment or location of the headquarter of school districts. There is no total agreement on any. Second, property taxes by county from CG92 were distributed by category: residential, commercial and industrial, agriculture, and other, using the 1991 proportion from IA Government Finances and Trends (1992), Table 38, (primary source: IA Department of Management). Finally, revenues collection from each of these categories were assigned to its respective sector: households, other businesses and agriculture.

All other resources were taken as given in the CG92 tables. Education charges were distributed by county enrollment.

ii) Expenditures

Expenditures by programs were taken directly from CG92 tables.

2) State government.

i) Revenues

Total revenues are also from CG92 and Gov. Finances. The distribution by county origin is done with the structure of income (1990) and sales (1991) from IA Government Finances and Trends (1992), table 44. For corporation income taxes distribution we assumed previous report year (1985-88) share for agriculture and business in the state totals. For the distribution by county of the state collection of agricultural corporation taxes paid, we used the proportion of 'farm income county' in 'farm income total' (in the state) from the BEA data on Personal Income by Major Source, (CA5) code 012.

ii) Expenditures

All the information is from CG92 and Government Finances.

Finally, the composition of state and local expenditures in terms of salaries and purchases of goods and services is derived from directly from the Government Finances. Transfers to people are estimated from percentages of matching funds for the main welfare programs: AFDC and Title XIX. Transfers to business represent state aid to other business. The information came from Iowa Department of Economic Development.

Federal Government.

i) Revenues

Taxes paid to federal government by type of taxpayer. All data came from Government Finances, table 4: Summary of Federal Government Finances; and Personal Income by Major source and Earnings by major Industry, CA5; BEA.

Corporation Income taxes were allocated between agriculture and other businesses using the shares estimated as in state above. The distribution by county was based on proportion of 'non-farm income' in total income in each county, line code 082 in the BEA data.

Individual Income taxes were distributed using the county proportion of total of 'earnings + dividends + rents + interest,' codes 045 and 046.

Total Sales taxes were disaggregated using the proportion for the county income in total income, code 010, and assigned to other businesses.

Sales of agricultural Products were disaggregated across counties according to the county 'farm income' proportion, code 012.

Contributions to social security were apportioned into counties by taking 11% of 'residential earnings', code 045.

ii)Expenditures

All data on expenditures came from the Consolidated Federal Funds Report (CFFR, vol.1): Federal Government Expenditures or Obligations by State and County Area; and Federal Expenditures by State, various tables. Data is for fiscal year 1992. Total federal spending into programs is the total spending in the state of Iowa except for the grants to local and state governments. There is no separation of this total by programs. Using CFFR and Expenditure by state we were able to separate the three object categories: salaries, purchases and transfers. All are direct from the publication except for the fact that transfers were included in "other payments" category that we apportioned to agriculture or other businesses using the detail at state level from Expenditures by state. In general, CFFR provides county structure for obligations, which is assumed valid for true spending. Expenditures by state provides the true outgoing of funds.

Intergovernmental Funds

Intergovernmental flows were taken from CG92 and checked with Government Finances, CFFR and Federal Expenditures by state. Intergovernmental transfers from federal government to state and local governments are shown as one number. We were not able to distinguish block from categorical grants by programs at the county level.

II) County Distribution Methodology

1) Expenditures on Goods and Services.

The object is to allocate local and state government purchases by county of origin. The data is available in this form for federal purchases directly from CFFR. We assume that each county sends its payments for goods and services to a pooled account and so does the state. There is data for the total of local and state government expenditures for fiscal year 1992. Then, we want to know how this amount enters the flow of funds of each county. (This is related especially to the industry structure and working population in each specific county). For the construction of the 99 coefficients to be used to calculate the distribution of that total, we use three sources of data. First we use the

B.E.A. RPC's for Iowa by commodities. The classification uses an aggregation of the I-O industry classification (or its correspondent SIC) to 127 groups of commodities. With this we can get what part of the total government purchases goes into the state of Iowa (IA). Second, also from B.E.A.-REIS, we use the earnings (labor compensation) by place of work and by activity for the 99 counties. The classification has the same base as above but aggregated into 95 categories- some of which are just subtotals. In order to apportion the RPC's to the county level, we take the county proportion of the total IA earnings by activity to represent the contribution of each county to the value added in that activity. Third, we use the government final demand composition by commodity to be able to apply the coefficients by county and commodity-activity. The information came from B.E.A., I-O Accounts of the U.S. Economy, 1987 Benchmark; commodity composition of NIPA Final Demand; table C. This information uses an 85 group commodity classification of the state and local government purchases, distinguishing education from the rest of the programs. This is for the total U.S. economy and may embrace some differences but there is no such a detail of data at any regional level.

Since the classification detail used by the RPC's and the final demand composition were much closer between them than with the earnings classification, we proceed to combine those two first, in order to avoid larger errors. This may be seen as a coefficient that represent the government purchases of each commodity or group of commodities inside IA.

Then we make the classification here and in the county earnings compatible. This implied regrouping in both of them. All the regrouping follow strictly the SIC classification detail.
To sum up earnings to make new categories is perfectly fine, but we know that just average the RPC's is not the best. (The best would be to have more detailed classification of the gross product and weight each RPC by the corresponding proportion on the state gross product.) The situations in which we had to average (and the RPC's show some differences) are not of major relevance for the government purchases, therefore, the classification seemed appropriate. (Note that most relevant distortion occurs when pooling "food and kindred" for education purchases).

Finally the two structures were combined, always maintaining the separation between education and rest of the government (except utilities that should be considered into the private sector). This final coefficient tells what part of the government purchases of each commodity goes into each county.

2) Employment Compensation.

In this case we want to allocate the amount of salaries and wages paid by government at any of the three levels (federal, state and local) into counties of residence. We will assume, as in the case of goods and services, that the local governments make payments into an IA pooled account. Again we are interested in showing how the government spending enters the economic flow of each county area, and this depends first on where people live. First, we need to note here that working with the salaries and wages paid by federal, state and local government in IA has the problem of the interstate work-migration. We do not have any data on people working for government coming from outside the state, but because of the private workers pattern we expect the distortion not to be very large in the aggregate.

Here we will use the data on employment by place of residence by broad activity categories from the Population Census 1989-90. We will maintain the distinction between education and rest of government. Education employment is all together (private services and public system), but the private education services are irrelevant in the total (compare number from IA Department of Employment or $ from BEA at the State level); so we work with the total amount of employees in education. (The estimates that this number gives is totally compatible with other sources at the total: Iowa Department of Employment Services, Employment Retirement System publication of Census of Governments 1992 (CG92), V4 (6), i.e.: active membership.)

We did a two way estimation of the flow of salaries into each county so to double check. First, just taking the proportion of each county in the total IA government employment, apportion the data on total payments by the government in IA. Second, take the proportion of government employment in the employment of each county, always by place of residence. Update it with data from IA Department of Employment Services by county and get a number of employees in government in each county. Using an average salary for 1992 in government activity get the earnings from government employment by place of residence. The average salary is 1987 Census of Governments (CG87) data updated by inflation.

III) Fiscal Effort Index Methodology

We apply ACIR methodology at county level. The actual collection of revenues comes directly from the matrix. The theoretic capacity is calculated in two ways, leading to two indexes. One, relative to the national average capacity, is calculated by applying the same national representative rate, by type of tax or revenue source, that ACIR uses. A second one, relative to the state capacity, is constructed using a state average rate that is calculated following ACIR methodology (i.e. total collection over taxable base).

The only resources considered are Property taxes and Charges, which are the two principal sources of income for local governments. For property taxes the average rates by type of property (ACIR, 1991) are applied to the property base in each county. Total property base, at market values, estimated by ACIR for the state is distributed by county using the county structure of actual assessed values from CG92. The main difference in assessed values from market values is the rollback percentage applied to residential property.

For Charges, the estimated capacity at state level (ACIR,1991) is distributed by population.

APPENDIX IV: IOWA RESULTS

IVa. Iowa SAM by Clusters (millions)

		CLUSTER 1							CLUSTER 2									CLUSTER 3							
		Agr.	Busin.	Comm Market	Factor Market	House-holds	*Subtotal*	Local Gov.		Agr.	Busin.	Comm Mark	Factor Mark	House-holds	*Subtotal*	Local Gov.		Agr.	Busin.	Comm Market	Factor Market	House-holds	*Subtotal*	Local Gov.	*Subt. Local*
C	Agric.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
L	Busin.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
U	Comm.Mark.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S	Factor Mark.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T	Households	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	Local Gov.	85	59	0	0	145	289	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	289
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C	Agric.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
L	Busin.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
U	Comm.Mark.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S	Factor Mark.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T	Households	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	Local Gov.	0	0	0	0	0	0	0	0	256	179	0	0	670	1105	0	0	0	0	0	0	0	0	0	1105
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C	Agric.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
L	Busin.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
U	Comm.Mark.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S	Factor Mark.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T	Households	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	Local Gov.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	102	538	0	0	1288	1928	0	1928
	Subtotal	85	59	0	0	145	289	0	0	256	179	0	0	670	1105	0	0	102	538	0	0	1288	1928	0	3321
	School Distric	0	0	0	0	0	0	143	0	0	0	0	0	0	0	443	0	0	0	0	0	0	0	741	1327
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P	Educat.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
R	O.Pub.G&S	0	0	0	0	0	0	250	0	0	0	0	0	0	0	982	0	0	0	0	0	0	0	1685	2917
G	**Total Prg.**	0	0	0	0	0	0	250	0	0	0	0	0	0	0	982	0	0	0	0	0	0	0	1685	2917
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O	Purch.G&S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
B	Salaries	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
J	Transfers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total Obj.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	State	0	92	0	0	259	351	0	0	1	433	0	0	894	1328	0	0	0	1454	0	0	1750	3204	0	4883
	Federal	8	113	0	294	394	810	0	0	33	408	0	987	1362	2790	0	0	11	1017	0	2246	2817	6091	0	9691
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	94	264	0	294	798	1450	250	0	290	1019	0	987	2926	5222	982	0	113	3008	0	2246	5856	11223	1685	20812
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Net ExtraR Tr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

School Distr.		PROGRAMS State & Local Educ.	Other Pub.G&S	Federal Total	*Total Prg.*		OBJECTS Purch.	Salar.	Transf.	*Total Obj.*	*State*	*Federal*	*Total*
0	0	0	0	0	0	0	0	0	381	381	0	0	381
0	0	0	0	0	0	0	0	0	34	34	0	0	34
0	0	0	0	0	0	0	195	0	0	195	0	0	195
0	0	0	0	0	0	0	0	446	0	446	0	0	446
0	0	0	0	0	0	0	0	0	967	967	0	0	967
0	0	0	0	0	0	0	0	0	0	0	71	10	369
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	357	357	0	0	357
0	0	0	0	0	0	0	0	0	58	58	0	0	58
0	0	0	0	0	0	0	720	0	0	720	0	0	720
0	0	0	0	0	0	0	0	1418	0	1418	0	0	1418
0	0	0	0	0	0	0	0	0	2706	2706	0	0	2706
0	0	0	0	0	0	0	0	0	0	0	253	26	1384
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	496	496	0	0	496
0	0	0	0	0	0	0	0	0	130	130	0	0	130
0	0	0	0	0	0	0	2621	0	0	2621	0	0	2621
0	0	0	0	0	0	0	0	3236	0	3236	0	0	3236
0	0	0	0	0	0	0	0	0	4107	4107	0	0	4107
0	0	0	0	0	0	0	0	0	0	0	255	102	2285
0	0	0	0	0	0	0	3536	5099	9236	17871	579	138	21909
0	0	0	0	0	0	0	0	0	0	0	1380	26	2733
0	0	0	0	0	0	0	0	0	0	0	0	0	0
2919	0	0	0	0	0	0	0	0	0	0	1105	0	1105
0	0	0	0	0	0	0	0	0	0	0	3436	0	6353
2919	0	0	0	0	0	0	0	0	0	0	4542	11397	18856
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	796	2019	721	3536	0	0	0	0	0	0	0	3536
0	0	2442	1839	818	5099	0	0	0	0	0	0	0	5099
0	0	0	1039	8197	9236	0	0	0	0	0	0	0	9236
0	0	3238	4897	9736	17871	0	0	0	0	0	0	0	17871
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	4883
0	0	0	0	0	0	0	0	0	0	0	0	0	9691
0	0	0	0	0	0	0	0	0	0	0	0	0	0
2919	0	3238	4897	9736	17871	0	3536	5099	9236	17871	5121	11535	73210
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	-214	1457	1661	2904	0	0	0	0	0	0	0	2904

IVb: Balance-Imbalance and Fiscal Effort Measures

FIPS Code	COUNTY Name	Fiscal Effort Index (N)	Fiscal Effort Index (S)	Per Cap Gov't Rev-Spe (dol.)
	State	118	113	137
19001	Adair	115	99	-522
19003	Adams	97	86	-922
19005	Allamakee	110	103	-71
19007	Appanoose	101	100	-1291
19009	Audubon	144	123	-250
19011	Benton	96	89	322
19013	Black Hawk	148	149	501
19015	Boone	145	138	-1060
19017	Bremer	126	124	587
19019	Buchanan	117	107	253
19021	Buena Vista	123	113	159
19023	Butler	96	86	-503
19025	Calhoun	93	79	-1260
19027	Carroll	150	139	1298
19029	Cass	167	154	-365
19031	Cedar	89	82	436
19033	Cerro Gordo	90	87	712
19035	Cherokee	90	80	-181
19037	Chickasaw	99	90	22
19039	Clarke	161	154	-259
19041	Clay	166	150	812
19043	Clayton	100	93	-655
19045	Clinton	97	93	-104
19047	Crawford	142	127	49
19049	Dallas	115	113	1094
19051	Davis	221	208	-142
19053	Decatur	165	154	-3011
19055	Delaware	141	131	1138
19057	Des Moines	102	100	-448
19059	Dickinson	96	99	1024
19061	Dubuque	96	97	1178
19063	Emmet	101	89	-1537
19065	Fayette	154	138	-342
19067	Floyd	143	132	-94
19069	Franklin	151	130	-183
19071	Fremont	83	71	-1040
19073	Greene	168	140	-168
19075	Grundy	125	110	661
19077	Guthrie	121	111	-628
19079	Hamilton	156	140	1191
19081	Hancock	107	93	236
19083	Hardin	156	141	-227
19085	Harrison	122	110	-1046
19087	Henry	144	135	526
19089	Howard	163	144	-90
19091	Humboldt	135	118	-369
19093	Ida	94	81	-182
19095	Iowa	91	83	1144
19097	Jackson	134	129	-358
19099	Jasper	144	139	1735

19101	Jefferson	137	132	432
19103	Johnson	89	89	188
19105	Jones	87	81	-432
19107	Keokuk	102	89	-1296
19109	Kossuth	117	98	-201
19111	Lee	113	110	389
19113	Linn	103	104	573
19115	Louisa	94	86	2175
19117	Lucas	166	160	-192
19119	Lyon	82	71	523
19121	Madison	126	121	49
19123	Mahaska	135	129	268
19125	Marion	90	90	238
19127	Marshall	114	110	867
19129	Mills	80	75	-3808
19131	Mitchell	131	118	568
19133	Monona	104	91	-1890
19135	Monroe	130	122	-1198
19137	Montgomery	176	164	-50
19139	Muscatine	126	123	1921
19141	O'Brien	121	106	140
19143	Osceola	90	76	-420
19145	Page	127	120	-546
19147	Palo Alto	143	121	-950
19149	Plymouth	115	106	1030
19151	Pocahontas	92	75	-762
19153	Polk	123	122	717
19155	Pottawattamie	102	101	-3119
19157	Poweshiek	90	85	-641
19159	Ringgold	184	165	-1630
19161	Sac	96	84	-486
19163	Scott	101	101	626
19165	Shelby	154	136	427
19167	Sioux	134	124	552
19169	Story	172	170	-1120
19171	Tama	100	88	-726
19173	Taylor	107	96	-2381
19175	Union	212	201	-755
19177	Van Buren	166	151	-1192
19179	Wapello	116	115	-366
19181	Warren	83	86	388
19183	Washington	130	122	589
19185	Wayne	142	128	-2215
19187	Webster	107	100	68
19189	Winnebago	126	115	252
19191	Winneshiek	135	128	-1126
19193	Woodbury	118	116	564
19195	Worth	95	83	-831
19197	Wright	130	114	-41

Source: Own calculations based on ACIR methodology.

NOTE: (N) relative to national average rates.
(S) relative to state average rates.

APPENDIX V: SAMPLE STATISTICS

Variable	Label	Mean	Std Dev
X4	rev-spending per capita	-172.3232323	12.32
X9	pop urb total	38.2814207	25.3965395
X12	pop rural total	61.7185793	25.3965395
X13	enrolled	19.4864592	2.3431980
X14	age 65 +	18.3201464	3.3834778
X15	unemployment	2.4682792	0.6529274
X16	income per capita	11.1445455	1.1426279
X17	% HH income less than 12500	24.1664646	4.2265790
X20	% HH income 50000 +	12.3933333	3.6949704
X23	farms number	1062.42	298.7123075
X24	farms less than 50 acres	17.6696970	4.6244791
X25	farms 500 acres and over	19.5000000	5.4122499
X26	fiscal effort relative to Iowa	113.9292929	27.6417506
X27	fiscal effort relative to U.S.	123.2626263	29.3742862
X28	% worforce outside county	22.2131313	11.7227900
X29	% workforce in manufact	17.7000000	5.3998110
X30	% workforce in trade	20.6505051	2.7828694
X31	% workforce in agriculture	13.4282828	6.1571104
X32	% workforce in rest (inc.gov.)	48.2212121	5.8213238
X33	% income from farming	5.9832323	4.2561523

APPENDIX VI: CLUSTER AND DISCRIMINANT

The following is an abstract of SAS output for cluster and discriminant procedures.

Ward's Minimum Variance Cluster Analysis

Eigenvalues of the Covariance Matrix

	Eigenvalue	Difference	Proportion	Cumulative
1	2.19283	1.33067	0.548207	0.54821
2	0.86216	0.30732	0.215539	0.76375
3	0.55483	0.16465	0.138708	0.90245
4	0.39018	.	0.097546	1.00000

Root-Mean-Square Total-Sample Standard Deviation = 1
Root-Mean-Square Distance Between Observations = 2.828427

NCL	--Clusters	Joined--	FREQ	SPRSQ	RSQ	ERSQ	CCC	PSF	PST2
9	CL19	CL28	14	0.02187	0.734	0.7749	-3.220	31.0	7.5
8	CL11	19153	14	0.02775	0.706	0.7558	-3.664	31.2	6.8
7	CL20	CL12	20	0.02945	0.676	0.7330	-3.927	32.0	11.3
6	CL8	CL15	20	0.03286	0.643	0.7051	-4.057	33.6	6.3
5	CL9	CL10	41	0.03522	0.608	0.6697	-3.881	36.5	12.1
4	CL7	CL25	22	0.04854	0.560	0.6225	-3.306	40.3	11.9
3	CL5	CL14	57	0.06709	0.493	0.5510	-2.482	46.6	20.0
2	CL3	CL6	77	0.19128	0.301	0.4195	-3.687	41.8	38.0
1	CL4	CL2	99	0.30132	0.000	0.0000	0.000	.	41.8

Stepwise Discriminant Analysis

99 Observations 15 Variable(s) in the Analysis
3 Class Levels 0 Variable(s) will be included

The Method for Selecting Variables will be: BACKWARD

Significance Level to Stay = 0.2500

Class Level Information

CLUSTER	Frequency	Weight	Proportion
1	22	22.0000	0.222222
2	57	57.0000	0.575758
3	20	20.0000	0.202020

Backward Elimination: Step 8

Statistics for Removal, DF = 2, 89

Variable	Partial R**2	F	Prob > F	Label
X4	0.3737	26.548	0.0001	rev-spending per capita
X12	0.3020	19.258	0.0001	pop rural total
X15	0.0441	2.054	0.1343	unemployment
X24	0.2693	16.404	0.0001	farms less than 50 acres
X25	0.2600	15.638	0.0001	farms 500 acres and over
X26	0.0877	4.280	0.0168	fiscal effort relat. to Iowa
X28	0.0515	2.417	0.0950	% worforce outside county
X33	0.1171	5.903	0.0039	% income from farming

No variables can be removed

Stepwise Discriminant Analysis

Backward Elimination: Summary

Step	Variable Removed	Number In	Partial R**2	F Statistic	Prob > F	Wilks' Lambda	Prob < Lambda
0		15	.	.	.	0.08610134	0.0001
1	X16	14	0.0010	0.040	0.9611	0.08618476	0.0001
2	X13	13	0.0145	0.610	0.5456	0.08745216	0.0001
3	X27	12	0.0209	0.895	0.4124	0.08931598	0.0001
4	X31	11	0.0151	0.651	0.5240	0.09068442	0.0001
5	X32	10	0.0108	0.471	0.6257	0.09167858	0.0001
6	X29	9	0.0101	0.444	0.6430	0.09261411	0.0001
7	X14	8	0.0213	0.960	0.3870	0.09463385	0.0001

Step	Variable Removed	Number In	Canonical Correlation	Prob > ASCC	Label
0		15	0.64823250	0.0001	
1	X16	14	0.64803085	0.0001	income per capita
2	X13	13	0.64401563	0.0001	enrolled
3	X27	12	0.64233174	0.0001	fiscal effort relat. to U.S.
4	X31	11	0.63993452	0.0001	% workforce in agriculture
5	X32	10	0.63868016	0.0001	% workforce rest (inc.gov.)
6	X29	9	0.63741738	0.0001	% workforce in manufact
7	X14	8	0.63395182	0.0001	age 65 +

Discriminant Analysis

99	Observations	98	DF Total
8	Variables	96	DF Within Classes
3	Classes	2	DF Between Classes

Class Level Information

CLUSTER	Frequency	Weight	Proportion	Prior Probability
1	22	22.0000	0.222222	0.222222
2	57	57.0000	0.575758	0.575758
3	20	20.0000	0.202020	0.202020

Discriminant Analysis   Linear Discriminant Function

	CLUSTER 1	2	3
CONSTANT	-7.60207	-0.83378	-7.85534
X4	-3.55768	0.51849	2.43574
X12	4.18795	-0.58226	-2.94732
X15	0.51976	0.14140	-0.97473
X24	-0.18330	-0.86008	2.65285
X25	2.87961	-0.40492	-2.01354
X26	-0.56904	0.36889	-0.42539
X28	-0.17019	0.31340	-0.70598
X33	0.48612	0.41790	-1.72576

	Label
CONSTANT	
X4	rev-spending per capita
X12	pop rural total
X15	unemployment
X24	farms less than 50 acres
X25	farms 500 acres and over
X26	fiscal effort relative to Iowa
X28	% workforce outside county
X33	% income from farming

Discriminant Analysis

Resubstitution Summary using Linear Discriminant Function

Number of Observations and Percent Classified into CLUSTER:

From CLUSTER	1	2	3	Total
1	21 95.45	1 4.55	0 0.00	22 100.00
2	0 0.00	57 100.00	0 0.00	57 100.00
3	0 0.00	0 0.00	20 100.00	20 100.00
Total Percent	21 21.21	58 58.59	20 20.20	99 100.00
Priors	0.2222	0.5758	0.2020	

Error Count Estimates for CLUSTER:

	1	2	3	Total
Rate	0.0455	0.0000	0.0000	0.0101
Priors	0.2222	0.5758	0.	

Cross-validation Summary using Linear Discriminant Function

Number of Observations and Percent Classified into CLUSTER:

From CLUSTER	1	2	3	Total
1	18 81.82	4 18.18	0 0.00	22 100.00
2	2 3.51	55 96.49	0 0.00	57 100.00
3	0 0.00	1 5.00	19 95.00	20 100.00
Total Percent	20 20.20	60 60.61	19 19.19	99 100.00
Priors	0.2222	0.5758	0.2020	

Error Count Estimates for CLUSTER:

	1	2	3	Total
Rate	0.1818	0.0351	0.0500	0.0707
Priors	0.2222	0.5758	0.2020	

Cross-validation Results using Linear Discriminant Function

Posterior Probability of Membership in CLUSTER:

Obs	From CLUSTER	Classified into CLUSTER	1	2	3
60	3	2 *	0.0000	0.5425	0.4575
75	1	2 *	0.4015	0.5985	0.0000
80	1	2 *	0.3725	0.6274	0.0000
85	2	1 *	0.5157	0.4843	0.0000
87	1	2 *	0.4500	0.5499	0.0000
95	1	2 *	0.1693	0.8242	0.0065
97	2	1 *	0.7237	0.2762	0.0000

* Misclassified observation

APPENDIX VII: SUMMARY STATISTICS BY GROUP

VIIa. Means by group

------------------------------------CLUSTER=1------------------------------------

Variable	Label	N	Mean
X4	rev-spending per capita	22	-1428.82
X12	pop rural total	22	87.8886368
X23	farms number	22	894.3181818
X24	farms less than 50 acres	22	14.8272727
X25	farms 500 acres and over	22	25.4181818
X13	enrolled	22	19.2351015
X14	age 65 +	22	20.9942447
X15	unemployment	22	2.3544075
X16	income per capita	22	10.3968182
X17	% HH income less than 12500	22	27.1681818
X20	% HH income 50000 +	22	9.7195455
X26	fiscal effort relative to Iowa	22	101.2272727
X27	fiscal effort relative to U.S.	22	113.8181818
X28	% workforce outside county	22	28.2318182
X29	% workforce in manufact	22	14.2318182
X30	% workforce in trade	22	19.6636364
X31	% workforce in agriculture	22	17.3545455
X32	% workforce in rest (inc.gov.)	22	48.7500000
X33	% income from farming	22	7.0318182
X34	% farmarea	22	89.1181818

------------------------------------CLUSTER=2------------------------------------

Variable	Label	N	Mean
X4	rev-spending per capita	57	69.6666667
X12	pop rural total	57	62.3391026
X23	farms number	57	1068.33
X24	farms less than 50 acres	57	16.4105263
X25	farms 500 acres and over	57	18.6824561
X13	enrolled	57	19.5616316
X14	age 65 +	57	18.7669977
X15	unemployment	57	2.5118272
X16	income per capita	57	10.9768421
X17	% HH income less than 12500	57	24.3326316
X20	% HH income 50000 +	57	11.5210526
X26	fiscal effort relative to Iowa	57	119.2982456
X27	fiscal effort relative to U.S.	57	130.0350877
X28	% workforce outside county	57	21.5298246
X29	% workforce in manufact	57	18.3456140
X30	% workforce in trade	57	20.4982456
X31	% workforce in agriculture	57	14.8105263
X32	% workforce in rest (inc.gov.)	57	46.3456140
X33	% income from farming	57	6.9563158
X34	% farmarea	57	89.7463158

-----------------------------------CLUSTER=3-----------------------------------

Variable	Label	N	Mean
X4	rev-spending per capita	20	520.1500000
X12	pop rural total	20	31.1630246
X23	farms number	20	1230.50
X24	farms less than 50 acres	20	24.3850000
X25	farms 500 acres and over	20	15.3200000
X13	enrolled	20	19.5487116
X14	age 65 +	20	14.1051119
X15	unemployment	20	2.4694263
X16	income per capita	20	12.4450000
X17	% HH income less than 12500	20	20.3910000
X20	% HH income 50000 +	20	17.8205000
X26	fiscal effort relative to Iowa	20	112.6000000
X27	fiscal effort relative to U.S.	20	114.3500000
X28	% workforce outside county	20	17.5400000
X29	% workforce in manufact	20	19.6750000
X30	% workforce in trade	20	22.1700000
X31	% workforce in agriculture	20	5.1700000
X32	% workforce in rest (inc.gov.)	20	52.9850000
X33	% income from farming	20	2.0565000
X34	% farmarea	20	83.0380000

VIIb. Manova results

The following are summary results for tests of mean differences between groups. Results are shown for 4 and 8 variables respectively.

Manova Test Criteria and F Approximations for
the Hypothesis of no Overall CLUSTER Effect
H = Anova SS&CP Matrix for CLUSTER   E = Error SS&CP Matrix

S=2   M=0.5   N=45.5

Statistic	Value	F	Num DF	Den DF	Pr > F
Wilks' Lambda	0.11919	44.095	8	186	0.0001
Pillai's Trace	1.147729	31.647	8	188	0.0001
Hotelling-Lawley Trace	5.150499	59.231	8	184	0.0001
Roy's Greatest Root	4.671072	109.77	4	94	0.0001

NOTE: F Statistic for Roy's Greatest Root is an upper bound.
NOTE: F Statistic for Wilks' Lambda is exact.

Manova Test Criteria and F Approximations for
the Hypothesis of no Overall CLUSTER Effect
H = Anova SS&CP Matrix for CLUSTER   E = Error SS&CP Matrix

S=2   M=2.5   N=43.5

Statistic	Value	F	Num DF	Den DF	Pr > F
Wilks' Lambda	0.094634	25.039	16	178	0.0001
Pillai's Trace	1.267904	19.484	16	180	0.0001
Hotelling-Lawley Trace	5.736094	31.549	16	176	0.0001
Roy's Greatest Root	4.964411	55.85	8	90	0.0001

NOTE: F Statistic for Roy's Greatest Root is an upper bound.
NOTE: F Statistic for Wilks' Lambda is exact.

APPENDIX VIII: BEALE CODE

VIIIa: Beale Code Categories

I. Metropolitan

1. *Large Metropolitan* - Counties part of standard metropolitan statistical areas (SMSA) with at least 1 million population.

2. *Medium Metropolitan* - Counties of SMSAs with 250,000 to 999,999 population.

3. *Small Metropolitan* - Counties comprising SMSAs with less than 250,000 population.

II. Non-metropolitan

4. *Urbanized Adjacent* - Counties with an urban population of at least 20,000 which are adjacent to a metropolitan county. Adjacent is defined as both touching an SMSA at more than a single point and having at least 1 percent of the labor force commuting to the central county of the SMSA for work.

5. *Urbanized Nonadjacent* - Nonadjacent counties with an urban population of more than 20,000.

6. *Less Urbanized Adjacent* - Adjacent counties with an urban population between 2,500 and 19,999.

7. *Less Urbanized Nonadjacent* - Nonadjacent counties with an urban population between 2,500 and 19,999.

8. *Rural Adjacent* - Adjacent counties with no place of 2,500 or more population.

9. *Rural Nonadjacent* - Nonadjacent counties with no places of 2,500 or more population.

Source: McGranahan et al. (1986)

VIIIb: County Beale Code and Cluster

FIPS Code	COUNTY	BEALE Code	CLUSTER
19001	Adair	8	1
19003	Adams	9	1
19005	Allamakee	7	2
19007	Appanoose	7	2
19009	Audubon	7	2
19011	Benton	6	2
19013	Black Haw	3	3
19015	Boone	6	2
19017	Bremer	6	3
19019	Buchanan	6	2
19021	Buena Vis	7	2
19023	Butler	8	2
19025	Calhoun	9	1
19027	Carroll	7	2
19029	Cass	6	2
19031	Cedar	6	2
19033	Cerro Gor	5	3
19035	Cherokee	7	2
19037	Chickasaw	7	2
19039	Clarke	6	2
19041	Clay	7	2
19043	Clayton	8	2
19045	Clinton	4	3
19047	Crawford	7	2
19049	Dallas	2	3
19051	Davis	7	2
19053	Decatur	9	1
19055	Delaware	6	2
19057	Des Moine	5	3
19059	Dickinson	7	2
19061	Dubuque	3	3
19063	Emmet	7	1
19065	Fayette	6	2
19067	Floyd	7	2
19069	Franklin	7	2
19071	Fremont	9	1
19073	Greene	7	2
19075	Grundy	8	2
19077	Guthrie	8	1
19079	Hamilton	7	2
19081	Hancock	7	2
19083	Hardin	7	2
19085	Harrison	6	1
19087	Henry	7	2
19089	Howard	7	2
19091	Humboldt	7	2

19093	Ida	8	1
19095	Iowa	8	2
19097	Jackson	6	2
19099	Jasper	6	3
19101	Jefferson	7	2
19103	Johnson	3	3
19105	Jones	6	2
19107	Keokuk	9	1
19109	Kossuth	7	2
19111	Lee	5	2
19113	Linn	3	3
19115	Louisa	8	2
19117	Lucas	6	2
19119	Lyon	6	2
19121	Madison	6	2
19123	Mahaska	7	2
19125	Marion	6	3
19127	Marshall	5	3
19129	Mills	6	1
19131	Mitchell	7	2
19133	Monona	6	1
19135	Monroe	7	2
19137	Montgomer	6	2
19139	Muscatine	4	3
19141	O'Brien	7	2
19143	Osceola	7	2
19145	Page	7	2
19147	Palo Alto	7	1
19149	Plymouth	6	2
19151	Pocahonta	9	1
19153	Polk	2	3
19155	Pottawatt	2	1
19157	Poweshiek	7	2
19159	Ringgold	9	1
19161	Sac	9	1
19163	Scott	2	3
19165	Shelby	6	2
19167	Sioux	7	3
19169	Story	4	3
19171	Tama	6	1
19173	Taylor	9	1
19175	Union	7	2
19177	Van Buren	9	1
19179	Wapello	5	3
19181	Warren	2	3
19183	Washingto	6	2
19185	Wayne	9	1
19187	Webster	5	2
19189	Winnebago	7	2
19191	Winneshie	7	2
19193	Woodbury	3	3
19195	Worth	9	1
19197	Wright	7	2

REFERENCES

Advisory Commission on Intergovernmental Relations (ACIR). Measuring the Fiscal Capacity and Effort of States and Local Areas. ACIR, Washington, D.C., (various years).

_____. Measuring State Fiscal Capacity: Alternative Methods and their Uses. ACIR, Washington, D.C., 1986.

_____. RTS State Revenue Capacity and Effort. ACIR, Washington, D.C., 1993.

_____. Characteristics of Federal Grant-in-Aid Programs to State and Local Governments. ACIR, Washington, D.C., (various years)

Bahl, R. Financing State and Local Government in the 1980s. Oxford University Press, New York, NY, 1984.

_____. "Trends in Intergovernmental Finances." In The Changing Face of Fiscal Federalism, edited by T. Swartz, and J. Peck. M.E. Sharpe, Inc., Armonk, NY, 1990.

Bahl, R. and Puryear, D. "Regional Tax Base sharing: Possibilities and Implications." National Tax Journal, 29(3), pp. 328-35, 1976.

Baumol, W. J. and Blinder, A.S. Microeconomics Principles and Policy (6th Edition) Dryden Press, Fort Worth, Texas, 1995.

Benabou, R. "Heterogeneity, Stratification, and Growth: Macroeconomic Implications of Community Structure and School Finance." American Economic Review 86(3) pp. 584-609, 1996.

Bennet, R. J. The Geography of Public Finance. Methuen, New York, NY, 1980.

Browning, E.K. and Browning, J.M. Public Finance and the Price System. (4th. edition). Macmillan Publishing Co., New York, NY, 1994.

Burkhead, J. "Public Finance as an Integral Part of Regional Accounts." In Elements of Regional Accounts, edited by W. Hirsch. Published for Resources for the Future, Inc. The Johns Hopkins Press, Baltimore, MD, 1964.

Child Hill, R. "Federalism and Urban Policy: The Intergovernmental Dialectic." In The Changing Face of Fiscal Federalism, edited by T. Swartz, and J. Peck. M.E. Sharpe, Inc., Armonk, NY, 1990.

Cochran, T. and Prestidge, J. "Growing Disparity Among States in Revenues from Non-Renewable Energy Sources." In Financing States and Local Governments in the 1980s, edited by N. Walzer, and D. Chicoine. Oelgeschlager, Gunn and Hain, Publishers, Inc., Cambridge, MA, 1981.

Cornes, R. and Sandler, T. The Theory of Externalities, Public Goods and Club Goods. (2nd. edition) Cambridge University Press, New York, NY, 1986.

Engerman, S. "Regional Aspects of Stabilization Policy" In Essays in Fiscal Federalism, edited by Musgrave, R. The Brookings Institution, Washington, D.C., 1965.

Everitt, B. Cluster Analysis.(3rd. edition) Halsted Press, New York, NY, 1993.

Goudy, W. and Charvat Burke, S. Iowa's Counties: Selected Population Trends, Vital Statistics and Socioeconomic Data. Iowa State University, Department of Sociology-Census Services, Ames, IA, 1993.

Gold, S. "State Finances in the New Era of Fiscal Federalism." In The Changing Face of Fiscal Federalism, edited by T. Swartz, and J. Peck. M.E. Sharpe, Inc., Armonk, NY, 1990.

_____. (ed). The Fiscal Crisis of the States. Lessons for the Future. Georgetown University Press, Washington, D.C., 1995.

Gramlich, E. "State and Local Governments and Their Budget Constraints." International Economic Review, 10(2), pp 136-81, 1969.

_____. "The Economics of Fiscal Federalism and its Reform" In The Changing Face of Fiscal Federalism, edited by T. Swartz, and J. Peck. M.E. Sharpe, Inc., Armonk, NY, 1990.

Hamilton, B.W. "A Review: Is the Property Tax a Benefit Tax?" In Local Provision of Public Services: The Tiebout Model After Twenty-Five years, edited by George Zodrow. Academic Press, New York, NY, 1983.

Hanushek, E.A. Rationalizing School Spending: Efficiency, Externalities and Equity, and their Connection to Rising Costs. W.A. Wallis Institute of Political Economy, University of Rochester. Working Paper #2, Jan.1995.

Heikkila, E.J. "Are Municipalities Tieboutian Clubs?" Regional Science and Urban Economics, 26(2), pp 203-26, 1996.

Henderson, J. "Local Government Expenditures: A Social Welfare Analysis." Review of Economics and Statistics, 50(2), pp 156-63, 1968.

Hewing, G. and Madden, M. eds. Social and Demographic Accounting. Cambridge University Press, New York, NY, 1995.

Hirsch, W.Z. ed. Elements of Regional Accounts. Published for Resources for the Future, Inc. The Johns Hopkins Press, Baltimore, MD, 1964.

Holcombe, R.G. Public Finance. West Publishing Company, St Paul, MN, 1996.

Hulten, C. and Schwab, R. " Income Originating in the State and Local Sector." In Fiscal Federalism: Quantitative Studies , edited by Harvey Rosen. The University of Chicago Press, Chicago, IL, 1988.

Inman, R.P. "Fiscal Performance of Local Governments: An Interpretive Review." In Current Issues in Urban Economics, edited by P. Mieszkowski, and M. Straszheim. The Johns Hopkins University Press, Baltimore, MD, 1979.

Iowa Department of Revenue and Finance, Information and Management Service Division. Iowa Corporation Income and Franchise Tax Report, (various years).

Iowa State University and the State of Iowa. Iowa Government Finances and Trends. Series RD-06, Ames, IA, 1992.

Johnson, R. and Wichern, D. Applied Multivariate Statistical Analysis. Prentice-Hall, Englewood Cliffs, New Jersey, 1992.

Kilkenny, M. "Operationalising a Rural-Urban General Equilibrium Model Using a Bi-Regional SAM." In Social and Demographic Accounting, G. Hewing, and M. Madden. Cambridge University Press, New York, NY, 1995.

King, B.B. "What Is a SAM?" In Social Accounting Matrices. A Basis for Planing, edited by G. Pyatt, and J. Round. The World Bank, Washington, D.C., 1985.

Ladd, H.F. and Yinger, J. America's Ailing Cities: Fiscal Health and the Design of Urban Policy. The Johns Hopkins University Press, Baltimore, MD, 1989.

McGranahan, D., Hession, J., Hines, F. and Jordan, M. Social and Economic Characteristics of the Population in Metro and Nonmetro Counties, 1970-80. U.S. Department of Agriculture, Economic Research Service, Rural Development Research Report (58). Washington, D.C., 1986.

Mieszkowski, P. and Straszheim, M. eds. Current Issues in Urban Economics. The Johns Hopkins University Press, Baltimore, MD, 1979.

Milligan, G. and Cooper, M. "An Examination of Procedures for Determining the Number of Clusters in a Data Set." Psychometrika, 50(2), pp 159-79, 1985.

Mills, E. S. and Hamilton, B. W. Urban Economics (5th Edition). Harper Collins, New York, NY, 1995.

Morgan, W., Mutti, J., and Rickman, D. "Tax Exporting, Regional Economic Growth, and Welfare" Journal of Urban Economics 39(2) pp. 131-59, 1996.

Musgrave, R. The Theory of Public Finance: a Study in Public Economy. McGraw-Hill, New York, NY, 1959.

Musgrave, R. and Musgrave, P. Public Finance in Theory and Practice. McGraw-Hill, New York, NY, 1976.

Netzer, D. State-Local Finance and Intergovernmental Fiscal Relations. Studies of Government Finance. The Brooking Institution, Washington, D.C., 1969.

Oakland, W. "Central Cities: Fiscal Plight and Prospects for Reform." In Current Issues in Urban Economics, edited by P. Mieszkowski, and M. Straszheim. The Johns Hopkins University Press, Baltimore, MD, 1979.

Oates, W. The Political Economy of Fiscal Federalism. Lexington Books, Lexington, MA, 1977.

_____. Studies in Fiscal Federalism. E. Elgar, Brokfield, Vt., 1991.

Oates, W. and Wallis, J. "Decentralization in Public Sector: An Empirical Study of state and Local Government." In Fiscal Federalism: Quantitative Studies, edited by Harvey Rosen, The University of Chicago Press, Chicago, IL, 1988.

O'Gorman, T. and Woolson, R. "Variable Selection to Discriminate Between Two Groups: Stepwise Logistic Regression or Stepwise Discriminant Analysis?" The American Statistician, 45(3), pp 187-93, 1991.

O'Sullivan, A. Urban Economics. (3rd. edition) Irwin, Chicago, IL, 1996.

Phares, D. "The Fiscal Status of the State-Local Sector: "A look to the 1980s." In Financing State and Local Governments in the 1980's. Issues and Trends, edited by N. Walzer, and D. Chicoine. Oelgeschlager, Gunn and Hain, Publishers, Inc., Cambridge, MA, 1981.

Pidot, G.B. "A Principal Component Analysis of the Determinants of Local Government Fiscal Patterns." Review of Economics and Statistics, 51(2), pp 176-88, 1969.

Pleskovic, B. and Trevini, G. The Use of a Social Accounting Matrix Framework for Public Sector Analysis: The Case of Study of Mexico. Monograph no.17, International Centre for Public Enterprises in Developing Countries, Ljubljana, Mexico, 1985.

Pommerehne, W. "Quantitative Studies of Federalism: A Study of Six Countries." In The Political economy of Fiscal Federalism, edited by W. Oates. Lexington Books, Lexington, MA, 1977.

Pyatt, G. "SAMs, The SNA and National Accounting Capabilities." Review of Income and Wealth, 37(2), pp 177-98, 1991.

Pyatt, G. and Round, J. eds. Social Accounting Matrices. A Basis for Planning. The World Bank, Washington, D.C., 1985.

Rose-Ackerman, S. "Beyond Tiebout: Modeling the Political Economy of Local Government." In Local Provision of Public Services: The Tiebout Model After Twenty-Five Years, edited by George Zodrow. Academic Press, New York, NY, 1983.

Rosen, H.S. Public Finance. (4th. edition). Irwin, Chicago, IL, 1995.

Round, J. "A SAM for Europe: social accounts at the regional level revisited." In Social and Demographic Accounting, G. Hewing, and M. Madden. Cambridge University Press, New York, NY, 1995.

Samuelson, P.A. "The Pure Theory of Public Expenditure." Review of Economics and Statistics, 36(4), 1954.

Serra, D. "The coherent covering location problem" Papers in Regional Science. The Journal of Regional Science Association International, 75(1), pp 79-101, 1996.

Shannon, J. "The Slowdown in the Growth of the State-Local Spending: Will it Last?" In Financing State and Local Governments in the 1980's. Issues and Trends, edited by N. Walzer, and D. Chicoine. Oelgeschlager, Gunn and Hain, Publishers, Inc., Cambridge, MA, 1981.

_____. "The Deregulation of the American Federal System: 1789-1989." In The Changing Face of Fiscal Federalism, edited by T. Swartz, and J. Peck. M.E. Sharpe, Inc., Armonk, NY, 1990.

Stelder, D. and Oosterhaven, J. "Consistency in regional demo-economic models: the case of the northern Netherlands." In Social and Demographic Accounting, G. Hewing, and M. Madden. Cambridge University Press, New York. NY, 1995.

Stone, R. "Social Accounts at the Regional Level: A Survey". In Regional Economic Planning, edited by W. Issard, and J. Cumberland, OECD Paris, 1961.

_____. "The Accounts of Society" Journal of Applied Econometrics, 1(1), pp 5-28, 1986.

Swartz, T. and Peck, J The Changing Face of Fiscal Federalism. M.E. Sharpe, Inc., Armonk, NY, 1990.

Tiebout, C.M. "A Pure Theory of Local Expenditures." Journal of Political Economy, 64(5), 1956.

U.N. Statistical Office. A System of National Accounts. Studies in Methods, Series F, no.2 rev.3, U.N. New York, 1968.

_____. System of National Accounts, 1993. Studies in Methods, Series F, no.2 rev.4, U.N. New York, 1993.

U.S. Department of Commerce, Bureau of The Census. 1987 Census of Government. (volumes 1-5). U.S. GPO, Washington, D.C., 1992.

_____. 1992 Census of Governments: Finance Statistics. (Preliminary) (CD ROM 92GOVFIN1). U.S. GPO, Washington, D.C., 1996.

_____. 1989-90 Census of Population and Housing, Summary Tape, File 1A. Census Services Iowa State University, Ames, IA, 1992.

_____. 1992 Consolidated Federal Funds Report: County Areas (vol I). U.S. GPO, Washington, D.C., 1993.

_____. 1992 Federal Expenditures by State, U.S. GPO, Washington, D.C., 1993.

_____. County and City Data Book: 1994. U.S. GPO, Washington, D.C., 1994.

_____. U.S. Statistical Abstract, 1995. U.S. GPO, Washington, D.C., 1995.

_____. Government Finances: 1991-92. U.S. GPO, Washington, D.C., 1995.

_____. State and Local Government Finances: 1991-92. U.S. GPO, Washington, D.C., 1995.

U.S. Department of Commerce, Bureau of Economic Analysis (Economics and Statistic Administration). Survey of Current Business, 74(4) U.S. GPO, Washington, D.C., 1994.

U.S. Department of Commerce, Bureau of Economic Analysis (Regional Economic Information Service). Personal Income by Major Source and Earnings by Major Industry and Gross State Product by Industry (fiscal year 1991-92, CD ROM), 1996.

_____. Input-Output Accounts of the U.S. Economy, 1987 Benchmark (diskette). Washington, D.C., 1994.

Walzer, N. and Chicoine, D. eds. Financing State and Local Governments in the 1980's. Issues and Trends. Oelgeschlager, Gunn and Hain, Publishers, Inc. Cambridge MA, 1981.

Zax, J. " The Effects of Jurisdiction Types and Numbers on Local Public Finance." In Fiscal Federalism: Quantitative Studies, edited by H. Rosen. The University of Chicago Press, Chicago, IL, 1988.

Zodrow, G.R. ed. Local Provision of Public Services: The Tiebout Model After Twenty-Five Years. Academic Press, New York, NY, 1983.