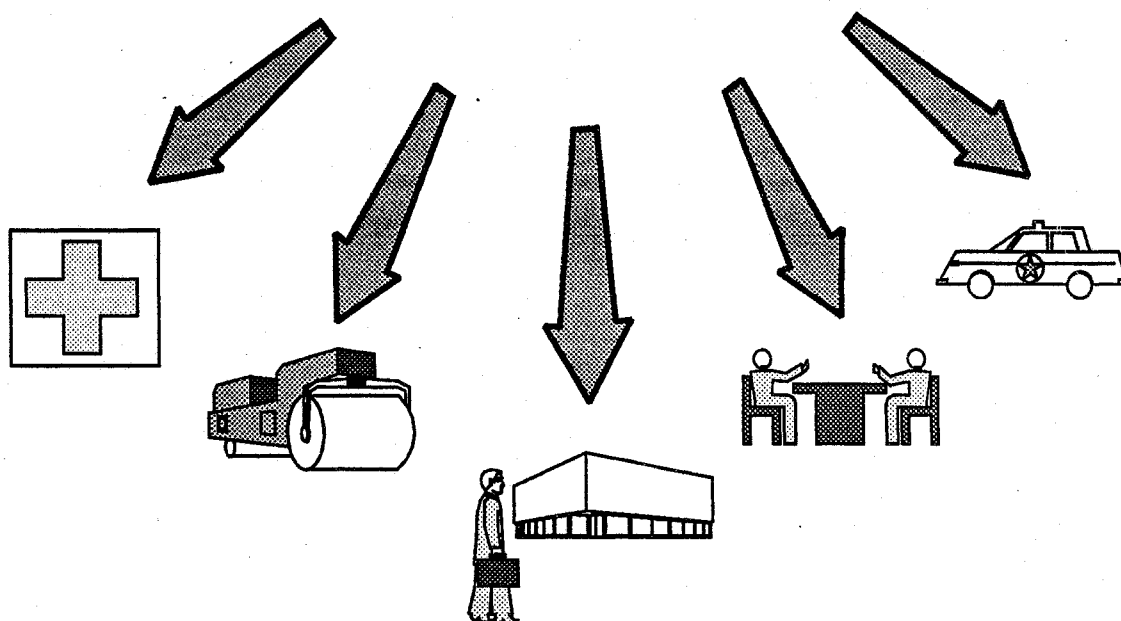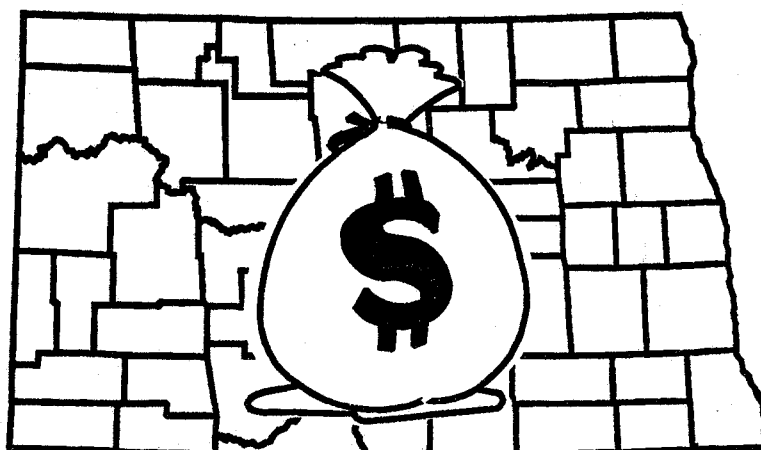Agricultural Economics Report No. 253   March 1990

Costs of Government Services
in North Dakota Counties

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ACKNOWLEDGEMENTS

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HIGHLIGHTS

This study examined the costs of providing public services by North Dakota counties. Ten years of county expenditure data, 1977-1986, were collected. County expenditures were put into eight categories; general government, law enforcement, education, emergency, health and human services, environment, highways and roads, and miscellaneous. The range of services provided by counties in North Dakota was identified.

Total county spending, in real dollars, increased about 19 percent from 1977 to 1986. North Dakota counties spent about $172 million in 1986 compared to about $139 million in 1977. Approximately 40 percent of all county spending was for highways and roads. General government and health and human services were second and third with about 21 and 19 percent of all expenditures, respectively. The greatest changes in spending occurred in education (-65 percent) and environment (+82 percent). Per capita county expenditures increased about 13 percent from 1977 to 1986.

Regression analysis was used to try to explain the factors influencing spending in the four major categories. Population, land area, density, and other variables pertaining to highways and roads were used as independent variables. Various combinations of population, land area, and density explained 17 (with the exception of some other variables), 66, 45, and 63 percent of the variation for highways and roads, health and human services, general government, and law enforcement, respectively, when regressed on only cross-sectional data. The same variables explained less of the variation in county expenditures when used on time-series and cross-sectional data. Little of the variation in per capita expenditures could be explained with the variables used. Results, while somewhat obvious (It appears that those counties with more money, or a stronger tax base, spend more!), will alert high-cost counties to their relative positions and may encourage them to seek out efficiencies.

Costs of Government Services
in North Dakota Counties

Dean A. Bangsund and Jay A. Leitch[1]

I. INTRODUCTION

The purpose of this study is to evaluate costs of public service
delivery by North Dakota counties, to identify potentially low- and high-cost
service delivery, and to suggest alternative arrangements to reduce costs.

County governments have a role in providing many essential public
services to citizens of North Dakota. Those services make a major
contribution to the quality of life in rural areas. Citizens demand
education, health care, and public safety just as they demand food, clothing,
and housing. However, the quality and quantity of public services are
dependent upon healthy and viable government units. Recently, county
governments have experienced fiscal stress resulting from pressure to maintain
current levels of services in times of financial difficulties.

Decline of the property tax base, loss of federal revenue sharing, and
continued demands for public services have placed financial strain on North
Dakota's local governments (Dorow et al. 1988). Local governments are
searching for new revenue sources, reducing unnecessary expenditures, and
seeking alternative methods of providing public services.

Fiscal pressure on local governments is twofold: (1) reduced revenues
from taxes and intergovernmental aid, and (2) growing demands for public
services during periods of population decline. Local governments' problems
with raising adequate revenue in recent years are a result of property tax
restrictions, decline of federal aid with loss of federal revenue sharing, and
the inability of state aid to compensate for loss of federal aid. Citizens
will continue to demand services, even in the face of inflation and decreasing
population. Local governments have an increased need for revenue, yet may
find it harder to generate and may need to provide the same services at
increased per capita cost.

Local governments' problems with raising revenue stem from the desire to
keep property taxes at acceptable levels, yet have adequate revenue. Property
tax comprises over 30 percent of total local government revenue and about 35
percent of total county government revenue (Dorow 1988). Since 1981, state
statues have placed limits on increases in property tax revenue. State law
limits the percent annual increase in dollars levied over the previous year
adjusted for changes in taxable property. These limits can be exceeded if
approved by a vote of the people in the taxing jurisdiction. Limits on
increasing property tax revenue are compounded by the loss of federal revenue
sharing, intensifying local governments' dependency on state aid. Reliance on
state aid remains high; however, state aid has not been able to compensate for
reductions in federal aid. Thus, local governments are forced to develop
other revenue sources or reduce spending.

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The demand for public services at the local level does not necessarily decline with decreases in population. Rural local governments in North Dakota must operate in the environment of providing public services to an aging population in sparsely populated areas. Even though population in many rural areas of North Dakota has declined, the demand for public services, both in quantity and quality, has not declined proportionately. Also, in the face of declining population, costs of providing public services have not decreased, at least not in proportion to the population decline. Thus, local governments attempt to continue to provide the same level and quality of public services with limited revenue.

Government has a tendency to grow faster than the economy for several reasons. The four reasons for government expansion include Wagner's Law, price elasticity of demand, population growth, and the expression of demand for public services through political institutions. Wagner's Law suggests that government grows and has a tendency for expansion because of the income elasticity of demand for public services. Income elasticity is a measure of the responsiveness in demand to a change in real income. If the elasticity coefficient of demand is equal to one, then a one percent increase in real income will generate a one percent increase in demand (for good/service in question). Since the public sector has grown faster than the economy as a whole, the income elasticity of demand must be greater than one, if increase in income was the only factor contributing to public sector expansion. However, studies have shown income elasticity of demand to be about 0.75, meaning a one percent increase in real income results in 0.75 percent increase in demand (Davis and Meyer 1983). Wagner's Law explains only part (25 percent) of the increase in government spending nationwide (Davis and Meyer 1983).

Price elasticity of demand is a measure of the responsiveness of demand for a good or service to its price. The price elasticity of demand for public goods and services has been estimated to be -0.56 (Davis and Meyer 1983). This means demand decreases only 0.56 percent with a corresponding one percent increase in price. Thus, as prices increase, demand decreases only about half as much. With a price elasticity of 0.56, demand for public goods and services will not respond equally to increases in prices. Rising costs (increased prices) facing inelastic demands account for about 10 percent of the increase in government spending (Davis and Meyer 1983).

Demand for public services would be expected to increase with population. If no scale economies exist, meaning the provision of goods and services becomes more efficient with increases in size, for providing government goods and services, then spending should increase by the same percentage as population. Along with increases in population, increases in population density can also cause increases in government spending. As population becomes more dense, economic and other interdependencies increase, raising demands in areas of health, sanitation, environment, safety, and congestion. Subsequent increases in government activity are usually called for. Approximately 20 percent of the increases in government spending result from increases in population and population density (Davis and Meyer 1983).

The largest single cause of increases in government spending is the imperfect way in which demand for public services is expressed through

political institutions. The political process is used to determine demand for government goods and services. Informed demands for public services are not properly transmitted through the political process. In private markets, individuals are fully aware of the market price of goods and services. However, in the public sector the true cost of a public good is often very difficult to detect. Thus, if the individual cost is estimated to be lower than actual, the signals sent would overinflate demand. Not only can the wrong aggregate demand be developed, but special interest legislation concentrates benefits to a particular group while distributing the costs to the entire population. Individual government agencies and bureaucracies often try to increase their budgets, as pay, power, and prestige can be related to budget and/or agency size (Buchanan and Flowers 1987). Although little empirical evidence exists on defects in the political process, inefficiencies in the political process can lead to increases in government expenditures.

County Government in North Dakota

The U.S. Constitution is the "supreme law of the land." Under the constitution, federal and state governments are considered equal partners, a form of dual federalism. The hierarchy of local governments varies by states. However, in North Dakota, counties, cities, townships, and special districts share the same level of authority, under the state Constitution (Figure 1). Special districts are government units designed to provide one particular service. North Dakota special districts include rural ambulance service, health, irrigation, park, public library, rural fire protection, soil conservation, water management, and school districts.
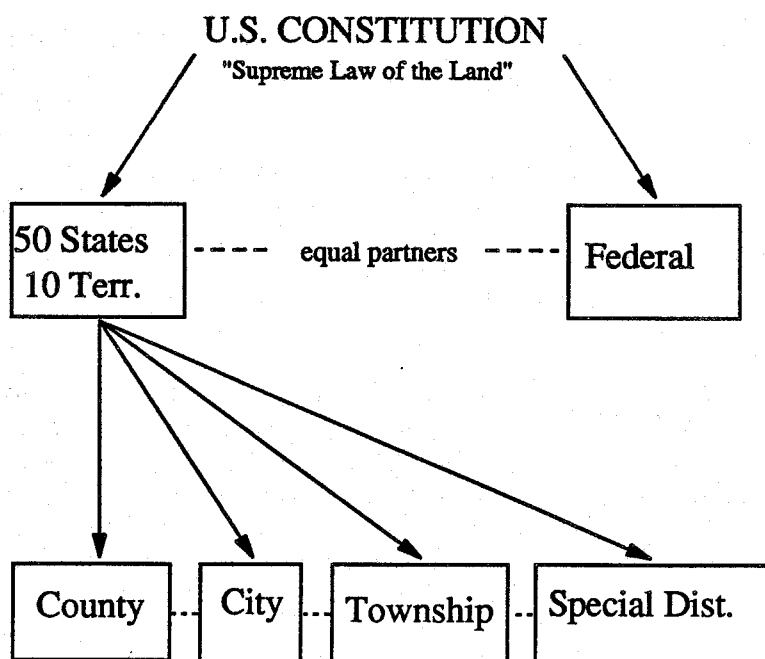
Figure 1. Government Structure in North Dakota.

Local governments play important roles in providing public services, performing functions for the state, and allowing constituents closer control over the use of taxes and resources. Public services provided by local governments include fire and police protection, education, refuse collection, emergency services, transportation, parks and recreation, health and welfare, water supply, sewer disposal, and others. Some state functions performed by local governments include enforcing state laws, conducting elections, assessing and recording property information, collecting local taxes, and delivering welfare services. In addition to the above services, local governments can provide other services and functions if voters agree and are willing to pay for them. This allows people to control and efficiently use local resources to better serve their communities.

North Dakota contains 53 counties. County boundaries were determined by frontier politics and natural geographic lines (Figure 2).
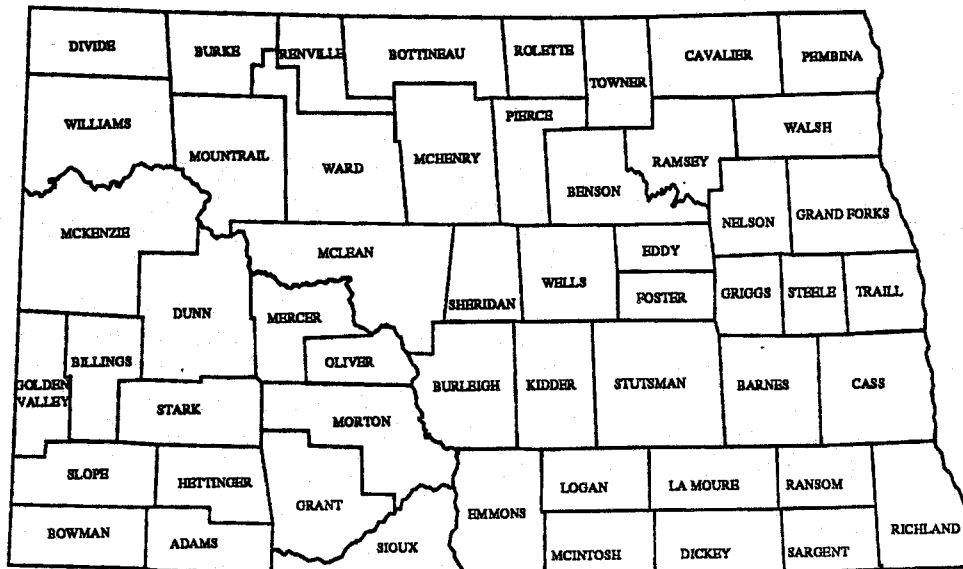
Figure 2. North Dakota Counties.

Figure 3 represents the typical county government organization in North Dakota. The first row of offices is filled by election, while the second row of offices is filled by appointment (Omdahl 1983). In addition to the traditional structure, the state Constitution provides counties with five optional forms, each with fewer elected officials.

Each county contains a county seat, which houses the county courthouse and county records. The most common services provided by North Dakota counties are rural police protection (sheriff), administration of county-wide social services, construction and maintenance of county road systems, collecting property taxes, filing and organizing property records, and developing local recreation and cultural areas.
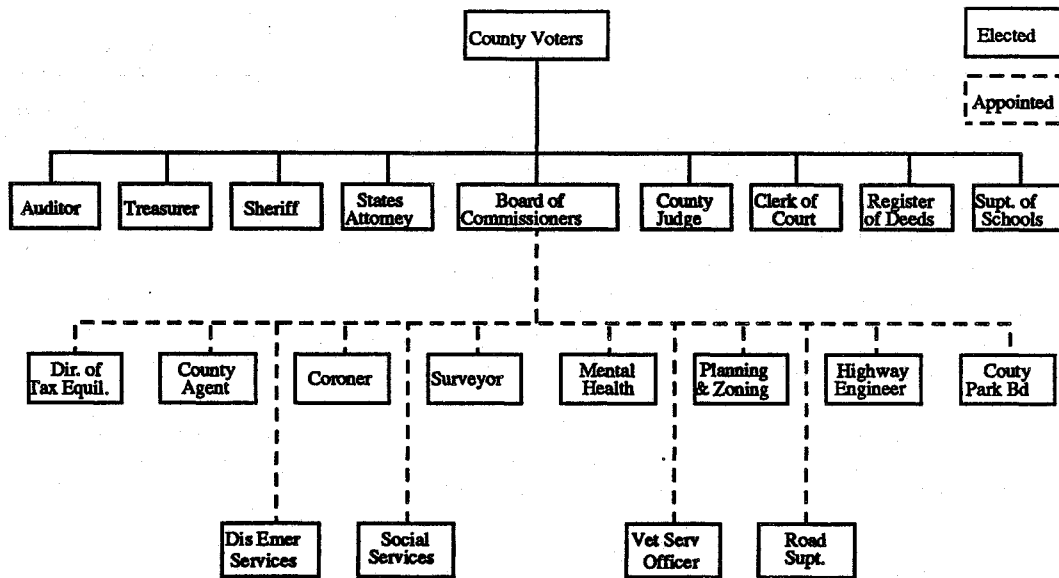
Figure 3. Typical Structure of County Government in North Dakota.

SOURCE: Omdahl, Lloyd O. 1983. 1983-1985 Governing North Dakota. Bureau of Governmental Affairs, University of North Dakota, Grand Forks.

    Counties across the United States provide a variety of services (Table 1). North Dakota counties provide a minimal set of services compared to counties in other states. The services that North Dakota counties must provide are determined by state statutes. Other services not listed in Table 1 that various North Dakota counties provide include weed control, weather modification, and disaster emergency services.

Need For Study

    Concern over the delivery and production of public services has grown in the 1980s. Several factors have contributed to the mounting attention focusing on local governments. Concern over increased property taxes, reduced intergovernmental aid, higher costs, and taxpayers' demands for more efficient use of tax money has forced many local governments to evaluate their spending habits. Possible reductions in local government expenditures for public services have raised public concern over quantity and quality of services provided. The demand for public services has not decreased, leaving local governments with the problem of satisfying increased demands for public services with limited or reduced funds. The concern over possible reduction or elimination of needed services has resulted in a need to better understand local government service delivery costs.

    The primary focus of this study is to examine costs of provision of services and identify alternative service delivery methods. During revenue shortfalls, local governments must choose between eliminating unnecessary services, increasing revenue, and/or providing services more efficiently.

TABLE 1. RANK OF SERVICES PROVIDED BY COUNTIES ACROSS THE UNITED
STATES AND NORTH DAKOTA, 1977-1986

Function	All Counties	Metro	Non-Metro	North Dakota[a]
		United States		
	(------percent------)			
Jails & Detention Homes	85	97	83	100[b]
Tax Assessment & Collection	83	83	83	100
Police Protection	82	78	82	100
Coroner's Services	80	87	78	100
General Assistance Public Welfare	79	76	79	100[c]
Roads & Highways	76	78	76	100
Courts	76	87	74	100
Agricultural Extension Services	75	75	74	100[d]
Public Health	75	80	74	53[e]
Medical Assistance	68	70	67	--
Prosecution	66	80	63	--
Mental Health	60	60	58	77
Probation & Parole Service	59	79	56	--
Elementary Schools	57	37	60	--
Libraries	56	57	56	23
Secondary Schools	54	39	56	--
Planning	52	76	48	--
Crippled Children	49	52	49	--
Veteran's Affairs	49	57	47	100[f]
Fire Protection	44	31	46	--
Zoning	43	55	41	--
Soil Conservation	41	39	41	55
Special Education Programs	40	38	41	60
Hospitals	39	41	39	--
Ambulance Service	38	23	40	43
Parks & Recreation	38	55	35	64
Animal Control	33	51	30	2
Airports	32	24	34	17
Public Defender	31	51	28	15
Subdivision Control	30	51	26	--
Solid Waste Disposal	29	37	28	4[g]
Sewers & Sewage Disposal	26	33	24	--
Refuse & Garbage Collection	23	21	23	--
Flood & Drainage Control	23	34	21	79[h]

CONTINUED

TABLE 1. RANK OF SERVICES PROVIDED BY COUNTIES ACROSS THE UNITED
STATES AND NORTH DAKOTA, 1977-1986 (CONTINUED)

| Function | United States | | | North Dakota[a] |
	All Counties	Metro	Non-Metro	
	(---------------------percent---------------------)			
Code Enforcement	21	42	18	---
Cemeteries	21	15	22	13
Water Supply	20	21	20	---
Livestock Inspection	20	23	19	---
Personnel Services	19	35	16	---
Central Processing	18	40	14	---
Auditoriums	17	17	16	11
Industrial Development	17	21	16	---
Mosquito Abatement	16	37	13	19[i]
Junior Colleges	16	27	14	---
Fish & Game	15	8	16	---
Air Pollution	14	37	10	---
Public Housing	13	19	12	---
Museums	13	17	12	66[j]
Power Supply	13	2	15	---
Data Processing	13	43	7	---
Water Pollution	12	30	9	---
Parking	9	11	9	---
Irrigation	6	3	7	---
Urban Renewal	5	9	5	---
Cultural Affairs	4	7	4	59
Ports & Harbors	4	9	3	---
Four-Year Colleges	3	9	3	---
Mass Transit	1	5	1	6[k]

[a]Services provided by North Dakota counties were determined by examination
of county financial records
[b]Includes county correction facilities and custody of prisoners
[c]Includes medicare, aid to families with dependent children, foster care,
medical assistance, food stamps, day care, speech and hearing,
alcohol and chemical dependency, and youth services
[d]Includes county agent
[e]Includes public health nurse and/or physician and other public health
programs
[f]Includes veterans' service officer
[g]Includes landfill operations
[h]Includes water management board
[i]Includes gopher, rat, and grasshopper control
[j]Includes county historical societies
[k]Includes county transportation and bus services

SOURCE: 1971 Advisory Commission on Intergovernmental
Affairs/NACO/International City Management Association Survey.

Problems with eliminating services include determining which services are to be cut or reduced and how much should be cut. Many of these decisions are political and can be very difficult to make objectively. Along with the politics of reducing or eliminating services, increasing taxes is unpopular. Which taxes should be raised and how much of an increase is needed are common questions regarding tax increases. Both represent difficult decisions and are often politically sensitive. The third option, providing services more efficiently, is generally accepted as the least difficult to accept and administer. Although "cutting the fat" is usually well received by taxpayers, achieving acceptable results can be difficult.

Local governments have many options when trying to improve efficiency. Need exists to discuss the options available and identify counties where efficiency improvements warrant attention. This can be done by examining all counties and identifying the range of outlays for similar services.

County governments are required, by federal and state statutes to provide some services. Yet many of these requirements do not have a state-level funding accompaniment. In sparsely populated areas, county governments could possibly provide these services more efficiently. Difficulties in efficiently providing services may arise because of geographic constraints, not necessarily in the organization of county governments. Geographic constraints may be reduced through intergovernmental cooperation, possibly the joint effort of two or more counties or city and county combinations.

Local governments in rural areas face several problems in delivering services. Service delivery in rural areas is often fragmented among agencies and governments, resulting in duplication of effort, underuse of resources, and uncoordinated services (Honadle 1980). Rural government staffs often lack adequate training to perform functions requiring a high degree of professional and technical skill (Honadle 1980). Thus, need exists to determine the most efficient use of existing county government resources and how these resources could be combined with other government units to more efficiently provide services in rural areas.

Geographical distances can account for many of the problems local governments have in delivering public services (Honadle 1980). However, other services may be more efficiently provided by incorporating economies of scale. Economies of scale refers to the relationship between output and the per unit cost of producing the output. Capital intensive services, rather than labor intensive services, can more fully utilize economies of scale. Differences in economies of scale can exist for increasing production per capita for a given population, or producing the same level of service per capita for a larger population. An examination of the cost structure of local governments in North Dakota could help determine if economies of scale exist, and if so, identify the most efficient scale of provision.

In addition to the use of economies of scale, efficient delivery of services can be accomplished through other methods. Common alternative service delivery approaches include volunteers, self-help activities, private contracting, franchise agreements, vouchers, intergovernmental cooperation, and regulatory and tax incentives (Shulman 1982). An analysis of the applicability of these options to local governments in North Dakota may provide options not currently used in the delivery of public services.

Scope

Provision of public services in North Dakota varies from basic services provided by small towns to those provided by the urban centers, mainly Fargo, Bismarck, and Grand Forks. A complete and simultaneous examination of all local government expenditures within the state would not be feasible. Counties were the first local general government unit to be analyzed. A companion study of North Dakota cities is underway.

North Dakota's counties differ greatly in population and land area (Figure 2). Counties range in size from 642 square miles for Foster and Eddy to 2,826 square miles for McKenzie. Likewise, 1986 county population ranged from 97,484 in Cass to 1,167 in Slope (U.S. Bureau of Census 1986). The economic, demographic, and geographic diversity of counties within North Dakota makes generalizing across counties impractical. Thus, selecting representative counties for analysis becomes very difficult. All county governments are examined in an attempt to capture the different situations within the state.

Objectives

The general objective of this study is to examine the cost structure of local public service delivery. Specific objectives include:

1) develop data sets[2] containing local government characteristics and itemized expenditures,
2) identify the range of public services provided by local governments in North Dakota,
3) use county characteristics in defining the cost structure of county government services, and
4) identify alternative policies and strategies to improve efficiency in the provision of public services.

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[2]County government expenditure data sets for 1977 to 1986 are available in: Dean Bangsund and Jay A. Leitch, March 1990, North Dakota County Government Expenditures, 1977-1986, Agricultural Economics Statistical Series No. 47, Agricultural Experiment Station, North Dakota State University, Fargo.

II. REVIEW OF STRATEGIES TO COPE WITH FISCAL PRESSURE

Rural governments are confronted with fiscal stress from several sources, including structural change in the local economic base, demographic shifts, reduced intergovernmental revenues, and declining tax bases. Reducing financial stress usually requires increasing revenue, reducing expenditures, and program/administrative innovations, or some of each (Cigler 1987).

Increasing Revenue

Increased revenue can come from user fees, capitalizing on new grants, raising taxes, imposing new taxes, or annexing additional land to increase the property tax base. User fees are appropriate considering the benefits received principle of tax fairness. User charges are nearly analogous to a price paid to purchase a specific good or service. User charges should not be used to support all government services but are helpful when the charge will discourage wasteful use of a service and where the benefits are directly linked to the individual paying. There are several advantages of user fees. They send signals to local governments on how much and what services to provide, help reduce wasteful use, can provide incentives to curb consumer use during peak hours, and the consumer can easily draw the connection between the fee paid and benefits received (Collins 1981).

Reducing Expenditures

The second area where local governments can reduce fiscal stress is to lower expenditures. The most popular mechanisms include alternative service delivery methods (contracting, franchise agreements, subsidies, vouchers, volunteers, self-help activities, and joint cooperation between other governments); applying economies of size; using regulatory and tax incentives; implementing cutback management strategies; and eliminating services. Many of these mechanisms require careful consideration, but can save money if used properly.

Alternative Service Delivery Methods

Local governments have found that delivering and maintaining all public services desired by citizens is expensive, inefficient, and in some cases impractical. As a result, local officials are searching for strategies to improve cost-effectiveness. One popular strategy is rethinking traditional service delivery and using alternative arrangements for services.

Cigler (1987) examined alternative local government service delivery methods and revenue raising options with a focus on potential constraints. The most feasible approach presented for researching rural service delivery options was to develop case study investigations. Cigler's hypothetical case study identified potential constraints to alternative service delivery options. These constraints included physical location, demographics, fiscal responsibility, government size, legal considerations, revenue enhancements, and expenditure reductions.

Shulman (1982) discussed various approaches for delivering public services, identified the range of services provided by cities and counties, and provided the common delivery methods currently used by local governments. Three basic options available to local governments to provide services are using local government employees, intergovernmental agreements, and arrangements with the private sector. The most commonly used private sector alternative approaches include service contracts, franchise agreements, subsidies, vouchers, volunteers, self-help activities, and regulatory and tax incentives. Alternative methods of providing solid waste collection by order of importance were private contracting, franchising, and intergovernmental agreements. By contrast, private contracting was the only non-traditional method of providing street and building repair and maintenance. Paratransit services were provided by intergovernmental agreements, private contracting, non-profit contracting, subsidies, and volunteers. Crime prevention and emergency medical services were characterized by having the same percentages of most of the alternative methods. Non-profit contracting, volunteers, and intergovernmental agreements were used extensively for day care provision and programs for the elderly. A substantial number of local governments arrange to have public services delivered using a variety of methods other than government provision.

Contracting

Contracting with a private sector vendor is used when services are being offered for the first time; services are repetitive, tangible, and easily measured and evaluated; services require specialized labor (e.g., legal services) or unskilled labor (e.g., janitorial services); or when services change their demand or scope (Shulman 1982). Contracting can be difficult when there is a long-standing tradition of public provision. Substantial employee layoffs may result, some services can be politically sensitive, or there may be strong employee or union resistance. A primary advantage of service contracting can be cost savings. Although contracting can save money, this may not be the rule. A private firm may be able to provide the service at a lower cost; however, the cost of preparing and administering the contract may negate the savings. An evaluation of all costs involved is essential in determining if savings would result with contracting services.

Florestano and Gordon (1980) conducted a nationwide survey to determine the extent and nature of private contracting by rural governments. Eighty-nine surveys of municipal governments of less than 50,000 population were used. The most frequently contracted services included street construction, architectural services, engineering services, legal counsel, building repair, and solid waste collection. The least frequently contracted services included police service, park maintenance, and building inspection.

Municipalities of 10,000 people or less, 25,000 to 49,999 people, 10,000 to 24,999 averaged 9.8, 7, and 5 delivered services through contracting, respectively. Jurisdictions under 10,000 population in the North Central region averaged 15 contracted services, almost twice as many as that for any other selected size category in the other geographic regions.

Professional services (architecture, engineering, and legal services), solid waste collection, street construction, and street maintenance

constituted the largest dollar volume among those contracted. Fifty percent of all contracts were awarded for one year, with job or project completion second at 21 percent. When asked to respond to selected value judgments, 40 percent of municipal administrators felt contracting costs less compared to 33.7 percent who felt it costs more than other alternatives. Ten percent of administrators felt contracting resulted in poorer services, versus 41 percent who felt contracting resulted in better services. Florestano and Gordon conclude that contracting provides a high quality service at a somewhat lower cost.

Franchise Agreements

A franchise agreement is a license, exclusive or nonexclusive, to a private firm to provide a particular service within a specified geographic area (Shulman 1982). Franchising works best when consumers can assess their personal needs for a particular service (e.g., solid waste collection). The difference between a franchise and a contract is that the consumer pays for the service directly, not through the local government. Also, with a franchise agreement, the local government plays a regulatory role. With franchise agreements, the local government can usually save money because it is no longer directly involved in providing the service. Although the cost to a local government will decrease, the cost to the consumer may not. Caution should be taken that the cost to the consumer does not increase beyond the point where the consumer would have had to pay higher taxes if the local government still provided the service (Shulman 1982).

Subsidies

Subsidies are financial or in-kind contributions by local governments to organizations for services to be delivered at a lower price, to enhance service quality, or to increase service levels (Shulman 1982). Subsidies are used when a strict performance contract is not feasible. Savings can result from using subsidies by helping private firms establish themselves and then rely on private enterprise to provide the service. Subsidy programs do not always save money because of lack of competition involving firms providing the desired service.

Vouchers

A voucher is a certificate that enables eligible citizens to select a private sector supplier to provide a particular service. Once the service has been purchased, the consumer or supplier turns in the voucher to the government for reimbursement (Shulman 1982). Vouchers are appropriate only when services are intrinsically private, when it is neither difficult nor time consuming to switch from one supplier to another, and when the service is tangible. The most common services using vouchers include day care and programs for the elderly. Savings from implementing a voucher program result from competition among suppliers. However, administrative costs are usually high, and total program savings should be evaluated.

Volunteers

Volunteers are citizens who do not receive payment for their work, with the exception of out-of-pocket expenses and must offer their services without coercion (Shulman 1982). Citizens volunteering for work are most likely to participate in activities they enjoy and those that give a feeling of accomplishment and personal growth. The key to successfully using volunteers is to identify, recruit, and properly place them. The costs of using volunteers, such as recruiting, training, organizing, and monitoring can be outweighed if they are used effectively.

Self-Help Activities

Self-help activities include those that an individual, neighborhood group, or community organization undertakes which results in reducing the amount of government activity that would otherwise be needed (Shulman 1982). The most common self-help activities include neighborhood watch programs and maintenance of neighborhood traffic islands. Self-help activities frequently focus on prevention rather than treatment (e.g., installing smoke detectors which ultimately reduces demands on fire departments). These activities are most successful when they are interesting and challenging, skills needed by group members are widely available and easily transferable, and they involve small contributions by large numbers of people. Self-help groups are frequently organized by location and/or basis of common need.

Intergovernmental Cooperation

Intergovernmental cooperation is usually defined as any instance in which two or more local governments work together to solve common problems (Honadle 1980). Governments can cooperate by jointly providing services (facilities), creating mutual aid agreements, using circuit rider programs, and purchasing services from each other. Joint provision of services usually involves situations where a facility can be centrally located, cost is prohibitively high for one jurisdiction, and large numbers can consume benefits without unduly interfering with the consumption of others. Examples of joint services include parks, police dispatching systems, and landfills. Mutual aid usually involves an agreement, explicit or informal, between two governments for the provision of a single service. These services usually involve problems that spillover from one jurisdiction to another, such as large fires, floods, or civil disorders. Purchasing services from another government is more successful when the service is noncontroversial and/or the service is new to the jurisdiction. Local governments generally receive citizen pressure to keep the provision of existing services local.

Circuit riders are traveling specialists who assist and advise local government officials on a wide range of issues, including financial administration, personnel management, capital programming, planning, community development, and land-use management (Sommer 1980). They are usually used when city and county governments need professional assistance but do not have the resources to hire a full-time employee. Circuit riders are usually classified as advisor, consultant, or manager. A circuit riders' responsibilities can be varied, assisting in most functions of government.

Many things need to be examined before implementing a circuit rider program, including number and size of towns, description of services or positions involved, program financing, salary and qualifications, recruiting, and structural organization (Sommer 1980). Circuit rider programs can improve local government efficiency by allowing access to technical assistance that is not otherwise available.

Local government officials can use interlocal cooperation, including joint facilities, mutual aid, and purchase of services (Honadle 1980). Examples of joint facilities include parks, police dispatching systems, and landfills. The most popular mutual aid agreements are fire and police protection. Purchasing of services can apply to most services produced and provided by local governments in North Dakota.

The Advisory Commission on Intergovernmental Relations (ACIR) (1983) reviewed intergovernmental service arrangements used in the provision of public services. Service contracts were used to deliver public services by 73, 52, 51, and 37 percent of cities and counties in the West, North Central, South, and Northeast; respectively. The most common reasons for entering into intergovernmental service contracts were to achieve economies of scale, need larger service area, lack of facilities, and eliminate duplication. Other reasons included lack of qualified personnel, remove politics, and citizen demands. In addition to reasons for entering into intergovernmental agreements, the most common factors inhibiting service arrangements were limitations on independence, inequitable apportionment of cost, adverse public reaction, and restrictions on terminating the contract. Services most frequently transferred from cities and counties were refuse collection, solid waste disposal, animal control, jails/detention homes, and tax assessing. Services most frequently transferred to cities and counties were police and fire communications, emergency and medical ambulance, solid waste disposal, computer and data processing, and traffic signal inspection and maintenance. The recipients of services transferred from counties and cities included other cities (10%), counties (33%), special districts (5%), regional organizations (8%), state governments (7%), private firms (28%), and nonprofit organizations (12%). (Percentages add to more than 100 because some transfers involve more than one recipient.)

The most common reasons for transferring services included lack of qualified personnel, lack of facilities, achieve economies of scale, eliminate duplication, need larger area, remove politics, and citizen demands. The agencies transferring services to counties and cities were other counties (26%), cities (43%), special districts (7%), regional organizations (5%), state governments (14%), private firms (10%), and nonprofit organizations (6%). (Percentages add to more than 100 because some transfers involve more than one transferring agency.)

Economies of Scale

Economies of scale/size refers to the reductions in per unit cost of producing a good or service that accompany increased production of a good or service. Emphasis is on the unit cost of providing a good or service because total expenditures may vary as the range of services provided changes.

Economies of scale can be realized in the provision of government services, however the degree of savings varies by service (Fox 1980).

Economies of size are determined by relating scale of production/output to average per unit costs (Fox 1980).

Average Cost = AC = f(I, P, S, T, N)

Where: I = number of input units
          P = price of inputs
          S = service conditions (e.g. population density, weather)
          T = state of production technology
          N = scale of production or output

Economies of size are evaluated by examining the relationship between AC and N and arise from a relationship between units of input per unit of output or a relationship between input cost per volume of output. The input/output relationship can have several possible explanations why the number of input units required to produce a unit of output falls when production is increased. First, increased specialization of labor permits workers to gain expertise in their functions allowing them more time to work on tasks appropriate to their skills. Second, increased specialization of managerial skills enhances management's efficiency. Third, large size may permit governments to employ cost-saving technologies. Large scale is sometimes needed to permit combining machines or processes that have different output rates. Fourth, some factors are not sensitive to changes in scale. For example, preparation of purchase orders for 500 units or for 50 units costs the same. Fifth, large scale operations are better able to use byproducts from the production process. Sixth, large organizations have greater ability to hedge against uncertainty (Fox 1980).

The input cost per volume of output relationship refers to the ability of larger production units to obtain favorable prices for inputs. Large production units are more likely to take advantage of volume discounts and other favorable price arrangements. Thus, as production increases so does the potential to reduce the per unit input costs. However, diseconomies arise when production is expanded too far. Problems in effectively managing larger operations lead to inefficiencies and eventually diseconomies set in. Overall, savings from economies of scale, due mainly from expanding operating size, can be achieved from input/output relationships and reduced input costs per volume of output. Diseconomies can set in when production is expanded beyond the capacity of effective management.

An important distinction can be made between capital intensive and labor intensive public services. With capital intensive services, the cost of capital usually is the major component of the cost structure and does not change with levels of output. Thus, when total costs (remaining somewhat constant because of large fixed costs) are divided by more units of output, lower per unit costs result. Water and sewer treatment systems are more capital intensive and are more likely to take advantage of economies of scale. With water and sewer systems, labor and other variable inputs change little with changes in output, thus as more output is spread over a fixed capital expense, economies of scale can be realized.

Labor intensive services such as police protection and health services are more likely to exhaust potential economies of scale early. Fixed costs are relatively low and variable costs relatively high for labor intensive services. Thus, as output is expanded, savings may not be substantial. For example, by increasing the number of policemen patrolling at any one time, more vehicles may need to be purchased to go along with increases in patrolmen, resulting in little savings as output is increased, with the possible exception of savings from more policemen per communication station or dispatch center. Also, when scale of organization matches closely with economies of scale, in-house production is more likely to prevail (ACIR 1987).

Fox (1980) found the most common estimation technique to analyze economies of size was ordinary least squares regression analysis. However, other techniques such as two-stage least squares regression, separable programming, mixed integer programming, linear programming, correlation analysis, and maximum likelihood estimation have also been used. Problems with public service data include measurement of costs, input uses, input price service conditions, technology, and output. Fox's review included articles examining economies of scale in education, fire protection, police protection, refuse collection, roads and highways, and water and sewer. Economies of size research can be helpful when analyzing government service delivery; however, caution should be used when developing policy implications using only economies of scale information.

Fire Protection

Several studies have examined economies of scale in fire protection. Hirsch (1965) found the average cost curve for fire protection to resemble a U-shaped curve with the low point at 110,000 residents served. Per capita total current expenditures plus debt service costs were used with population and an index of scope and quality of fire protection to estimate the cost curve. Will (1965) used regression analysis to relate population and costs per capita, based on standardized units of effort. Economies of scale were most noticeable for fire departments serving 300,000 people. Ahlbrandt (1973) used per capita expenditures, population, area size, and assessed values to examine both hired fire departments and volunteer fire departments. He found constant returns to scale for hired fire departments and decreasing returns to scale for all volunteer departments. Hitzhusen (1972) developed cost equations using five different cost proxies and two output measures. Output was measured by population and full value of property protected. Output was adjusted for quality by deficiency points awarded to departments by the American Insurance Association. The most efficient size was reached for communities of 10,000 people. These studies failed to provide information on the relationship between costs of a single fire station and the number of people and geographic area served since they focused on potential economies associated with city size.

Police Protection

Morris and Tweeten (1971) examined the social costs of crime to determine if economies occur with city size. Social costs of crime were measured by determining per capita expenditures for police protection

necessary to maintain the crime rate at or below a certain level. Two
equations were developed to determine if economies of size existed. The first
equation estimated the crime rate given city size and characteristics. The
estimated number of police per capita used to control a given crime rate was
then converted into dollars, yielding a cost for police protection. Costs
were lowest for cities in the range of 250,000 to 500,000 residents; however,
costs rose sharply for cities over one million people.

Popp and Sebold (1972) estimated police expenditures by using total
expenses and monetary compensation for crimes. Costs were a minimum for
cities of 250,000 people. Analyses focused on city-wide police protection; no
connection could be made to size economies of individual departments or
stations.

Walzer (1972) correlated the number of offenses, number of accidents
investigated, and miles traveled by police vehicles to determine if economies
of size exist for police protection. Percent of known offenses cleared was
used as a quality surrogate. Significant size economies were found using the
service index; however, no economies of size were found when population was
used as a measure of output.

Chapman, Hirsch, and Sonenblum (1975) approached police department
efficiency by developing a crime prevention production function. Five police
protection production functions were estimated using actual crime rates for
Los Angeles and a predicted crime rate. The functions each used a slightly
different output measure incorporating a punishment surrogate. Punishment
surrogates were measured by dividing arrests by the crime rate. Results
indicated a one percent increase in the number of police employees, and their
associated equipment, increased output (more arrests per given crime rate) by
substantially more than one percent. The authors concluded their study
indicated the existence of increasing returns to scale.

Roads and Highways

Swanson (1956) studied the cost of providing rural roads in Illinois.
The state was divided into nine regions to hold topographic and weather
conditions constant. Maintenance, administration, and construction costs were
used with eight separate types of roads to estimate total cost equations for
each region. Size economies were found throughout the size ranges examined.
However, conclusions were limited because the study focused only on rural
roads. Input costs were not considered and economies were not analyzed for
specific road types.

Lamb and Pine (1974) examined costs of providing rural roads in Kansas.
Total costs were used as a proxy for output with earth, gravel, and pavement
miles serving as surrogates for quality. County roads exhibited an inverted
U-shaped cost curve while non-county roads exhibited a U-shaped cost curve.
However, results were not conclusive because land area would appear to bear no
strong relationship with road services provided by local governments.

Lesher and Mapp (1974) examined costs of highway services for New York
counties. Multiple regression analysis combined administration, maintenance,
snow removal, and total costs with road milage to estimate economies of size.

County roads had downward sloping average cost curves for units up to 400 miles of roads, up to 590 miles for highway maintenance, and up to 490 miles for snow removal. Administration cost curves were minimum at 465 miles.

Multiple Services

Johnson (1973) analyzed per capita costs of eleven selected functions in six counties in South Dakota. The selected functions were county commissioners, auditor, treasurer, clerk of court, register of deeds, superintendent of schools, sheriff, states attorney, court functions, director of tax equalization, and courthouse maintenance. The six counties were geographically spread throughout the state and represented all aspects of the economic bases: agriculture, industry, tourism, mining, poverty areas, and state government. Various county officials were interviewed to develop a statistical profile, identify perceived reasons for cost increases, and identify attitudes toward several administrative changes in county government.

Multiple regression analysis on 1970 county government expenditures was used to develop a linear model explaining the factors influencing county costs. Nine independent variables were used to determine 13 different per capita cost variables, based on 11 selected cost functions and two total cost functions. The most significant independent variables were age dependency ratio, percent change in population from 1960 to 1970, and per capita assessed valuation. Coefficients of multiple determination (R^2) were generally high for most of the cost equations; however, they were low for courthouse maintenance, court cost, sheriff, and superintendent of schools. Results of the analysis indicated that for most of the county costs the independent variables used provided a major portion of explanation for cost differences, however, the lack of explanation for other functions indicated other important variables were not included. The analysis did not indicate any economies of scale.

Conclusion

Economies of scale have been shown to exist for fire protection, police protection, and highways and roads, and to provide savings at some stage of production. Results differed on the scale of production that resulted in the least cost production, possibly due to methods and data. Thus, there may be potential savings through economies of size for North Dakota public services.

Regulatory and Tax Incentives

Regulatory and tax incentives are used to stimulate or encourage the provision of public services by the private sector (Shulman 1982). They can vary widely but often take the form of zoning policies, special permits, code enforcement, and license requirements. Regulatory and tax incentives can be used to discourage and/or encourage private supply of services. Examples of regulatory and tax incentives include requiring residents to bring garbage to the curb (reducing trash removal expenses), property tax credits for homeowners who maintain public sidewalks adjacent to their property (reducing

demand for public works services), and tax credits for commercial buildings that have sprinkler systems installed (reducing demand for fire services).

Cutback Strategies

Management cutback strategies involve many options. The most common options include layoffs; hiring and wage freezes; reduce overtime and benefits; reduce utility, supply, and equipment costs; reduce maintenance; reduce spending on social programs, housekeeping services (police, fire, and sanitation), optional services, and general government functions; reduce participation in grant programs requiring matching contributions; and freeze capital spending. Many of these actions can have undesirable consequences, and governments should carefully analyze all options before making cuts.

Eliminating Services

Often as a last resort, governments can discontinue a service. When services are discontinued, three things can happen. The service may be discontinued permanently, another government unit may decide to provide the service, or a private profit or non-profit firm may provide the service. Several considerations must be made before eliminating a service. They include citizen resistance, lack of control should a private firm provide the service, required planning to phase out the service, possible political consequences, and problems with employee and union resistance. Currently, only a small number of local governments have discontinued public services. Of the services dropped, operation of bus transit, paratransit programs, tree trimming and planting, and recreation programs are those which were not subsequently provided by the private sector or another government (Shulman 1982).

Program and Administrative Innovations

Program and administration innovations can include a wide array of actions, such as new methods of fiscal management, personnel management, capital improvement programs, budgeting systems, adopting new technologies, and computerized management information systems (Cigler 1987). Others include centralizing purchasing functions, reviewing investment and insurance polices, using labor and cost saving equipment, implementing job enrichment programs, identifying performance appraisal methods, and assigning productivity rewards.

Conclusion

Local governments have many options available to help alleviate fiscal stress. These options fall into three broad categories: increasing revenue, reducing expenditures, and developing program and administration innovations. Even though many options exist in the various categories, local governments should attempt to implement an overall plan, using all three categories. Other areas of concern for governments developing an overall or comprehensive strategy include examining legal considerations of any plan of action, being aware of citizen concerns, weighing all costs involved, and paying attention

to service quality. Individual local government situations vary due to various combinations of structural (township, county, or city) and geographical differences, legal and statutory provisions, political climates, demographic profiles, and service dimensions and traditions. Thus, local governments should develop strategies specific to their unique needs.

III. PROCEDURE

Analysis of county government services in North Dakota required many steps. First, county expenditures were gathered and the information was used to develop individual and combined county data sets. In the process of developing an overall data set, identification of the various services provided by counties was completed. Using county characteristics, the cost structure for North Dakota counties was examined.

To develop data sets, itemized county expenditures were obtained from the North Dakota State Auditor's Office and county auditors. State audits of county expenditures and revenues were used for many counties. However, the availability of state audits varied by county. State audits do not exist for all counties because Billings, Bowman, Burleigh, Dunn, Golden Valley, McKenzie, Rolette, and Slope counties were privately audited. Private audits for these counties were not useful because of insufficient itemization of expenditures. The number of past audits on record at the state auditor's office also varied by county.

Since expenditure data for some years were not available through the state auditor's office, letters were sent to each county auditor requesting ten years, 1977-1986, of itemized expenditures (Appendix A). Expenditure data received from county auditors were in the form of year-end budgets, financial worksheets, computer printouts, and past state audits. The form of expenditure data varied by year and county (Appendix B).

To facilitate analysis of expenditure data, itemized expenses were categorized according to eight broad spending areas (Table 2) for three reasons. First, counties spend money on different programs and services. Thus, line-by-line expenditures do not always match across counties. Second, counties may incur similar costs but report them under different expense names. For example, some counties report separate listings of court and jury expenses; however, other counties include jury expense under court costs. Third, classifying expenditures in broad areas facilitates analysis and reduces the possibility of classification errors resulting from misinterpretation of county financial records.

The miscellaneous category includes expenditures for services which are different than those in the other categories, primarily public facilities such as parks, fairs, and museums.

Sometime in the middle 1980s (varies by county, most counties converted between 1982 and 1985), county governments in North Dakota converted from fiscal year budgets, i.e., July 1, 1979 to June 30, 1980, to calendar year budgets, i.e., January 1, 1982 to December 31, 1982. Fiscal year budgets were converted to calendar year equivalents. This conversion involves adding two years of itemized expenses and dividing by two, resulting in an estimation of the equivalent calendar year expense. Converting from fiscal to calendar years assumes spending was constant throughout the year, not concentrated in any month. Converting from fiscal to calendar years attenuates fluctuations in expenses between years (a high expense year combined with a low expense year results in an average of the two). Conversion also causes an expenditure incurred in one year, but not in the next year, to appear in the next year.

TABLE 2. AGGREGATED SPENDING CATEGORIES AND CORRESPONDING ITEMIZED
   EXPENDITURES FOR NORTH DAKOTA COUNTY GOVERNMENT SPENDING, 1977-1986

Spending Category	Expenditure Items
1. General Government	Operation of county offices, courthouse maintenance, county insurance, advertising, document printing, record keeping, interest on operating loans, economic development, debt repayment, office supplies and equipment, and federal and state aid (reported without specific expenditures)
2. Law Enforcement	All Court Expenditures Jail and Custody of Prisoners Sheriff States Attorney County Judge
3. Education	County Superintendent of Schools County Agent 4-H Programs Teachers' Retirement
4. Emergency	Disaster Emergency Services Emergency Fund Ambulance Services
5. Health and Human Services	Veterans Service Officer County Poor Social Services/Welfare OASIS and Social Security County Health Unit Board of Health Senior Citizens Mental Health Programs
6. Environment	Weed Control Soil Conservation Water Management
7. Highways and Roads	County Road and Bridge Highway Tax Distribution Fund Farm to Market Roads Unorganized Road and Bridge
8. Miscellaneous	County Libraries Parks Fairs Historical Society County Airport

If a county funds a project every other year, converted expenditures will show one-half of the amount spent to appear in the years when no expenses actually occurred. These data manipulations affect the results by making spending patterns less sensitive to time.

In addition to ten years of itemized expenses, the following demographic and selected characteristics are included for each county. These variables are:

> Population
> Number of government employees
> Employee salaries
> Road and highway miles
> Vehicle miles traveled
> County size
> Assessed land valuation

Sources of these variables were the State Census Data Center, State Highway Department, State Tax Department, and the N.D. Association of Counties. Although an attempt was made to collect data for ten years on each variable, several years of data on some variables were not available, nor were 10 years necessary (e.g., county size).

In addition to data for some years not being available, adjustments were made to expenditure and demographic variables. Superintendent of Schools and States Attorney Contingent funds were combined with the corresponding office's expenses. Spending from these funds was minimal and would not measurably affect either office's spending levels. County population estimates for 1979 were not available. An estimate of the county's 1979 population was determined by interpolating county population figures for 1978 and 1980.

Several counties either did not have or were not willing to provide some years' expenditures (Table 3). In addition to some missing county expenditures, several other variables were not available (Table 4).

Nominal expenditure data were adjusted to reflect 1986 dollars. Thus, expenditures for years 1977-1985 represent 1986 dollar equivalents. Inflators were obtained from the U.S. Department of Labor, Bureau of Labor Statistics. The actual inflator was calculated using 1986 as the base year.

The second stage of analysis of county government service delivery focuses primarily on identifying county services. Expenditures from 1977 to 1986 were examined to determine the services produced. Based on common expenditure categories (Table 2), low and high cost counties are identified using per capita costs and other measures comparing counties on a common basis. Low and high cost counties are examined in greater detail in an attempt to determine the factors influencing their cost structures.

The reasons for cost structure differences among counties is examined by using ordinary least squares regression analysis to identify the factors influencing spending levels. These differences may be procedural, such as contracting versus in-house production, or they may be due to a county's unique situation. The quality/quantity of services provided may account for some differences among counties.

TABLE 3.   MISSING YEARS OF EXPENDITURES FOR
NORTH DAKOTA COUNTY GOVERNMENTS, 1977-1986

County	Missing Years
Adams*	1977-1978
Bowman	1977-1979
Eddy	1977-1980
Grant	1977-1978
Kidder*	1977-1980
McLean*	1977-1982
Sioux	1977

*Sufficient breakdown of expenditures was not
attainable; however, total spending was
available.

TABLE 4.   MISSING YEARS OF DESCRIPTIVE VARIABLES FOR
NORTH DAKOTA COUNTY GOVERNMENTS, 1977-1986

Variable	Missing Years
County Government Employees	1977-1981, 1983, 1985
County Government Salaries	1977-1981, 1983, 1985
Highway Mileage	1978, 1981-1986
Vehicle Miles Traveled	1981-1983
Assessed Land Valuation	1982

Although the study focuses on cost structure and service delivery
methods, alternative revenue sources are also discussed. Examining current
revenue sources across counties may provide information on potential revenue
sources.   Coverage of alternative revenue sources is more general and broader
in scope than the analysis of expenditures. The focus is on exploring new
revenue sources and providing counties with information on adopting new
methods of revenue generation.

IV. RESULTS

North Dakota county spending for 1977-1986 and revenue for 1985 and 1986 were examined. Descriptive analyses include identifying trends for total county spending and spending by category. A brief discussion of county revenue sources is also included. Other descriptive analyses include inter-county spending, connection between land area and population on spending levels, and ranking of county real and per capita spending. A section on analytical results contains discussions of regression models for the four major spending categories.

Descriptive

County expenditures were first examined to identify trends and patterns during the ten-year period, 1977-1986. Expenditure data were analyzed using nominal and real dollars. Nominal dollars were used only when examining some spending trends, and real dollars were used for all other analyses.

Total Spending

Total county expenditures from 1977 to 1986 were examined to determine the nature and levels of spending (Figure 4). Total county spending increased 30 percent in real dollars from 1977 to 1986. (However, overall spending increased less than 30 percent because the data set does not contain expenditures for all years. Several counties' itemized expenditures were not available for the early years (Table 3). The absence of data for these years inflates the spending increase. With the inclusion of total spending for the missing years for Adams, Kidder, and McLean counties, real North Dakota county spending increased 19 percent.) Spending in real dollars remained almost constant from 1977 to 1982 with most of the increase in spending coming from 1982 to 1986. Some of the changes in total county spending can be explained by changes in state statutes limiting mill rate increases. In 1981, the state legislature allowed counties to increase the mill rate levies each year (increase based on given percent of previous year's rate). As a result, some of the increase in county spending from 1982 to 1986 can be attributed to changes in state statutes governing mill levy limits.

Per capita total spending represents a weighted average of real dollars spent per person by all counties (Figure 5). Per capita expenditures were first calculated for each county, then an average of the counties was calculated using county population as a weighing facto(the results represent the same value as if total county spending was divided by state population). Per capita spending increased 13.2 percent from 1977 to 1986. However, per capita spending decreased 7.5 percent from 1977 to 1982, then increased by 19.3 percent from 1982 to 1986. The decrease and then increase in per capita spending can be explained by examining state population dynamics (Figure 6). North Dakota population increased by 36,707 from 1980 to 1984, but has since declined.
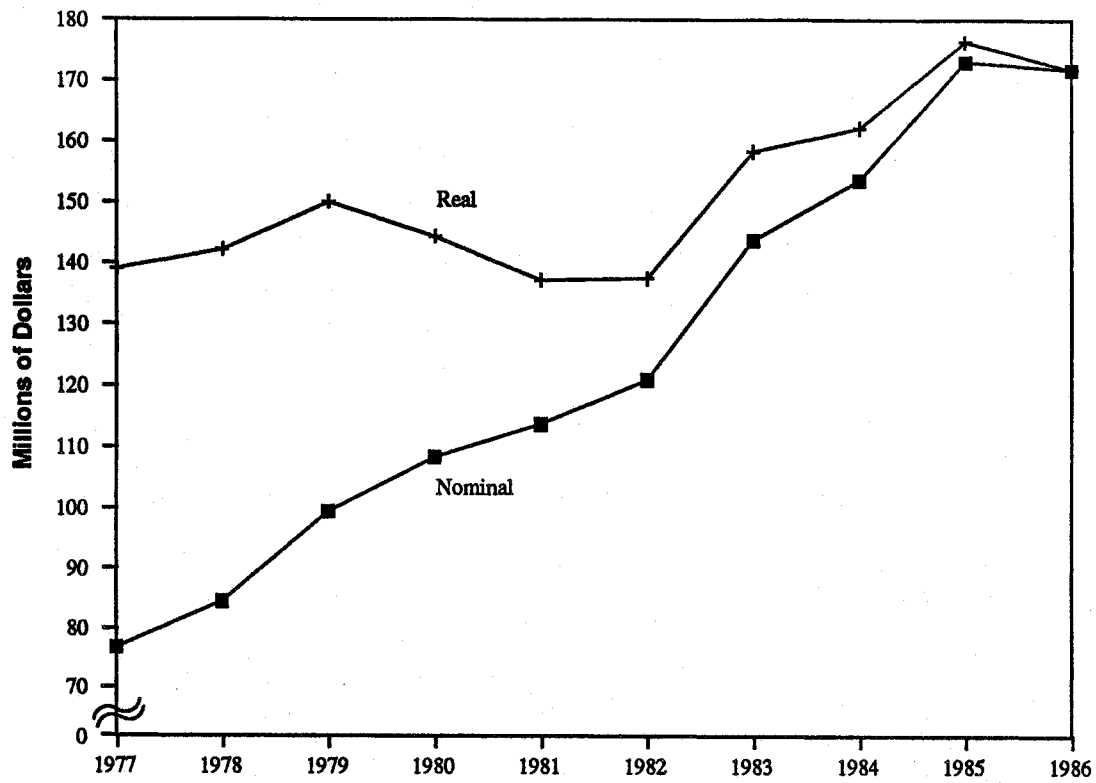
Figure 4. Nominal and Real Total County Spending, North Dakota, 1977-1986
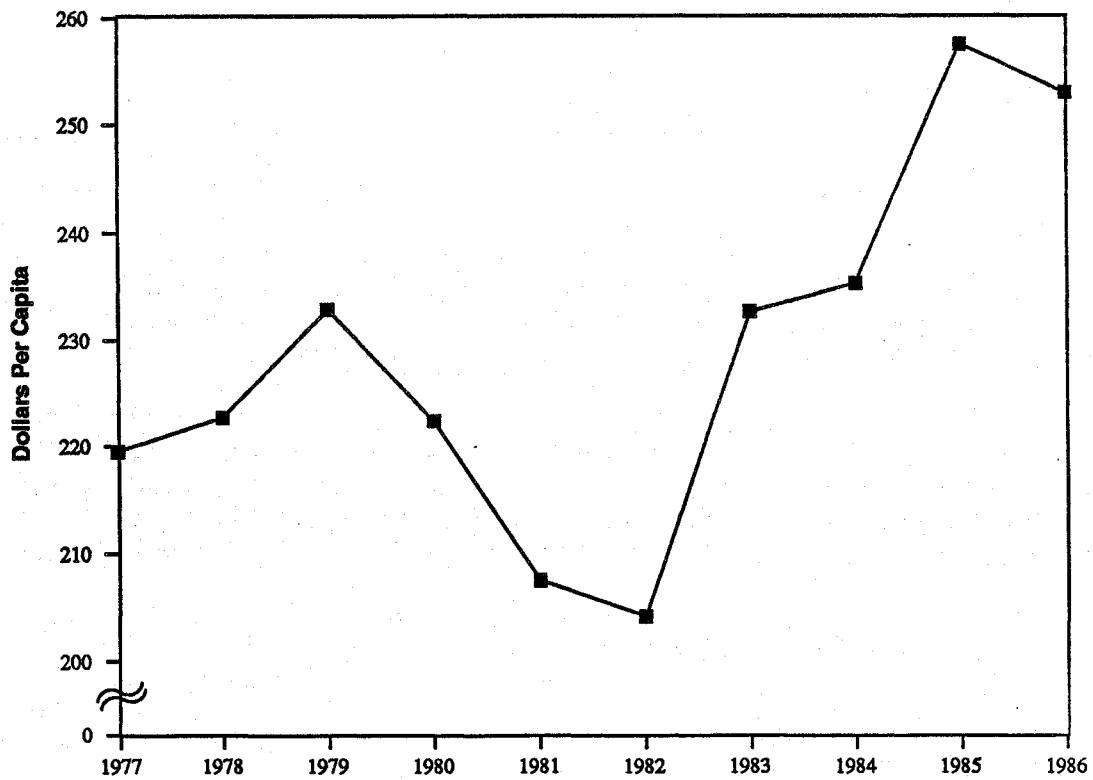
Figure 5. Real Per Capita Total County Spending, North Dakota, 1977-1986.
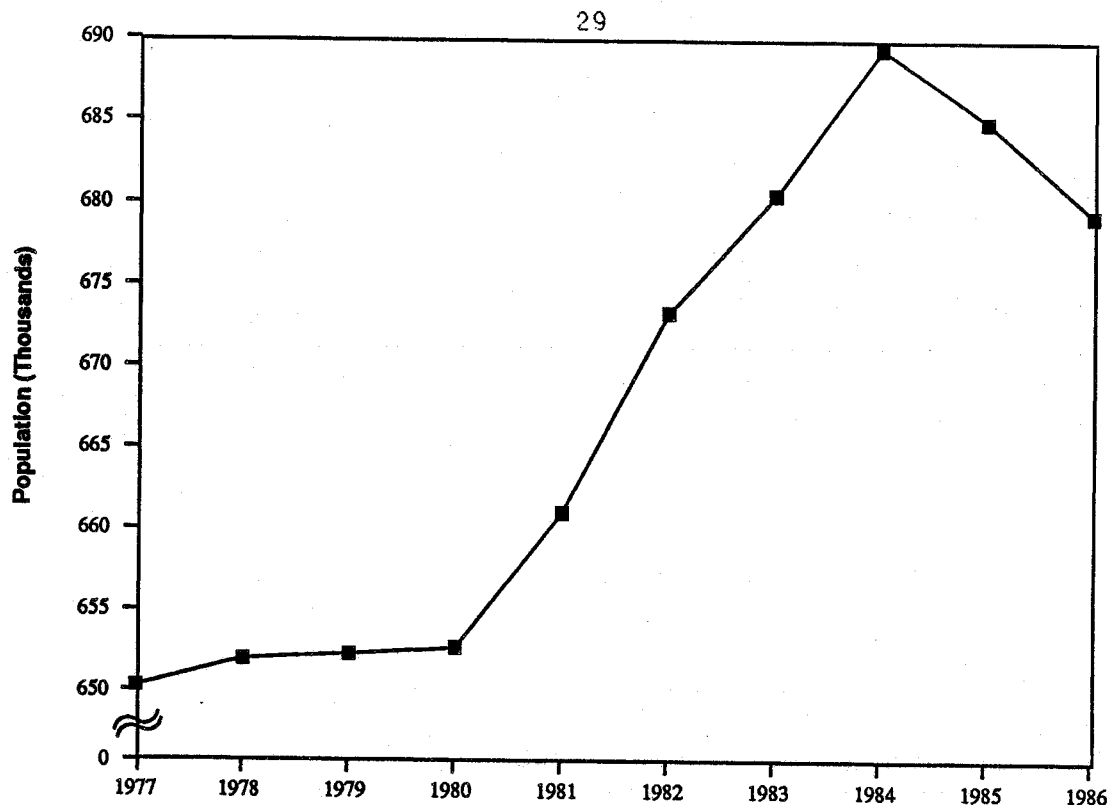
Figure 6. North Dakota Population, 1977-1986.

Changes in per capita spending from 1977 to 1986 can be put into perspective by comparing spending and population levels. An increase or decrease in either population or total expenditures will cause changes in per capita expenditures.

Spending By Category

The largest percentage increase in spending from 1977 to 1986 occurred in the environment category, increasing 471.6 percent (Figure 7). Correspondingly, the largest percentage decrease occurred in education, decreasing 65 percent. However, both "environment" and "education" are very small relative to the total and are somewhat ill-defined. More modest gains and reductions occurred in the other categories (Appendix C).

During 1977 to 1986, counties averaged about 40 percent of each year's expenditures on highways and roads (Figure 8). General government, law enforcement, health and human services, and highways and roads account for 91.7 percent of all spending. The remaining four categories (education, emergency, environment, and miscellaneous) account for only 8.3 percent of expenditures.

Because the four minor categories are such a small portion of all spending, the greatest opportunity for savings through improving the efficiency of service delivery exists in the four largest categories. For example, if the efficiency in delivering education services were improved 50 percent, the savings in 1986 for all counties would amount to $1.7 million. However, a 2.7 percent improvement in the delivery of highways and roads would save $1.7 million.
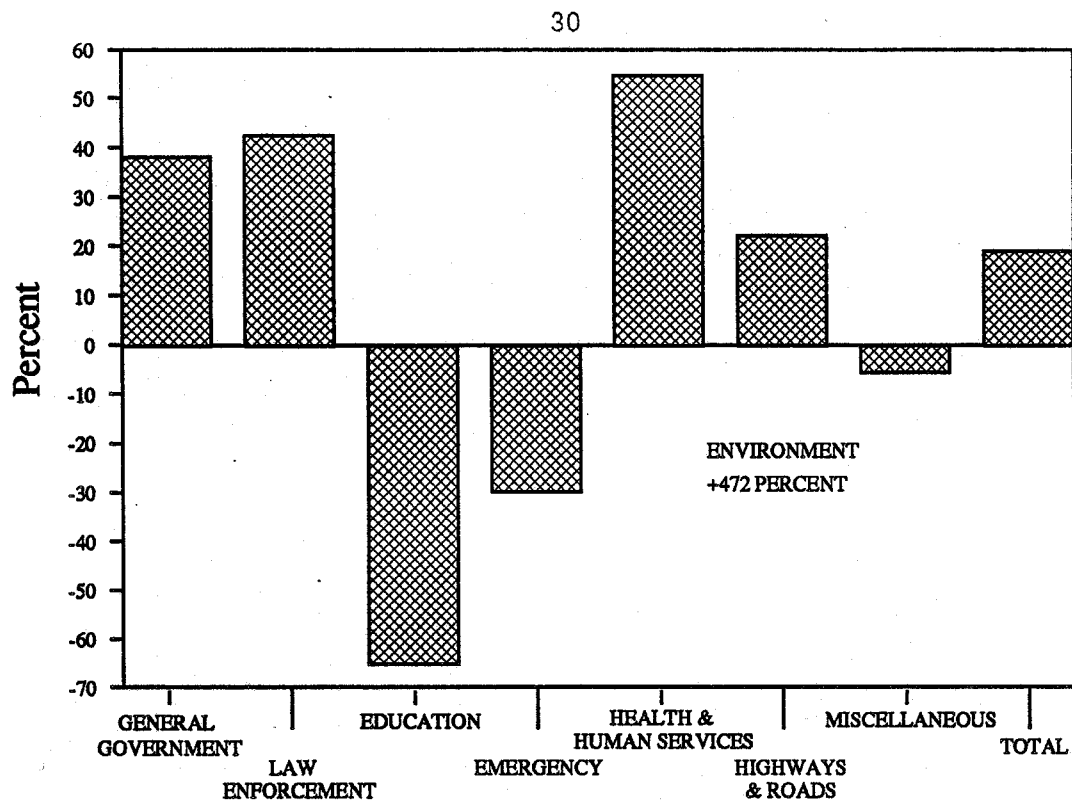
Figure 7. Percent Change in North Dakota County Government Spending by Category, 1977-1986.
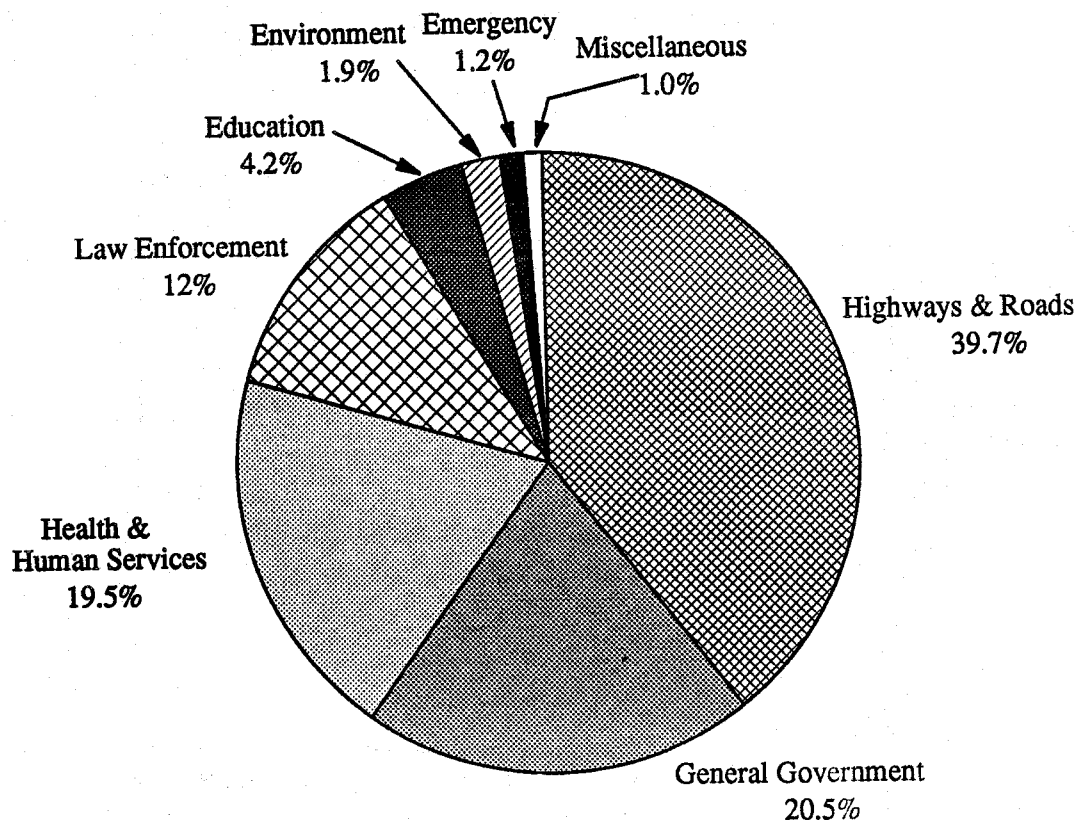
Figure 8. Average Percentage of All North Dakota County Expenditures by Category, 1977-1986.

Per capita spending in general government, law enforcement, and health and human services increased substantially from 1982 to 1986 (Figures 9 through 12). Per capita expenditures for highways and roads decreased since 1983. Increases and decreases in per capita spending for these categories correspond closely to increases and decreases in spending during the same time period (Appendix C). Per capita spending for education, emergency, environment, and miscellaneous categories varied over the 10-year study period (Appendix D).
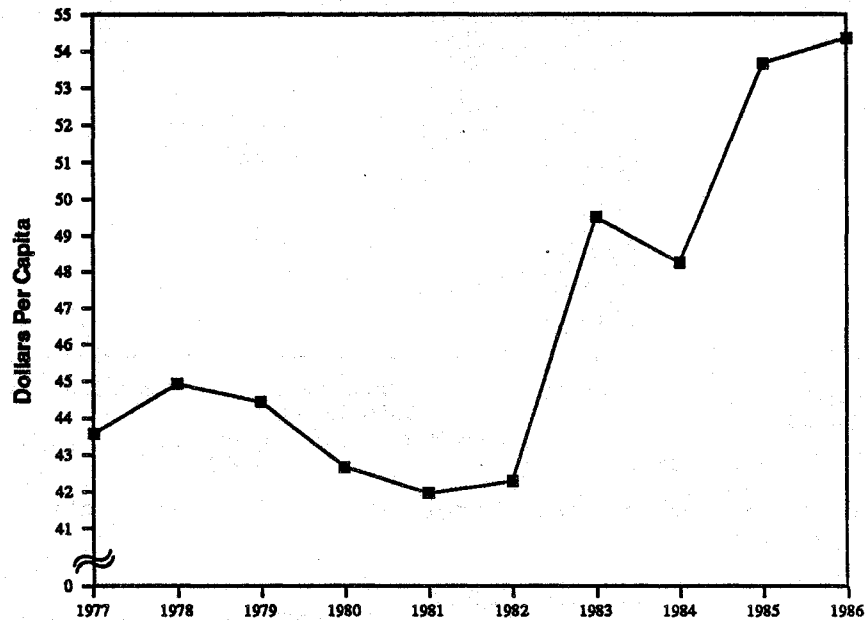
Figure 9. Real North Dakota County Per Capita Expenditures for General Government, 1977-1986.
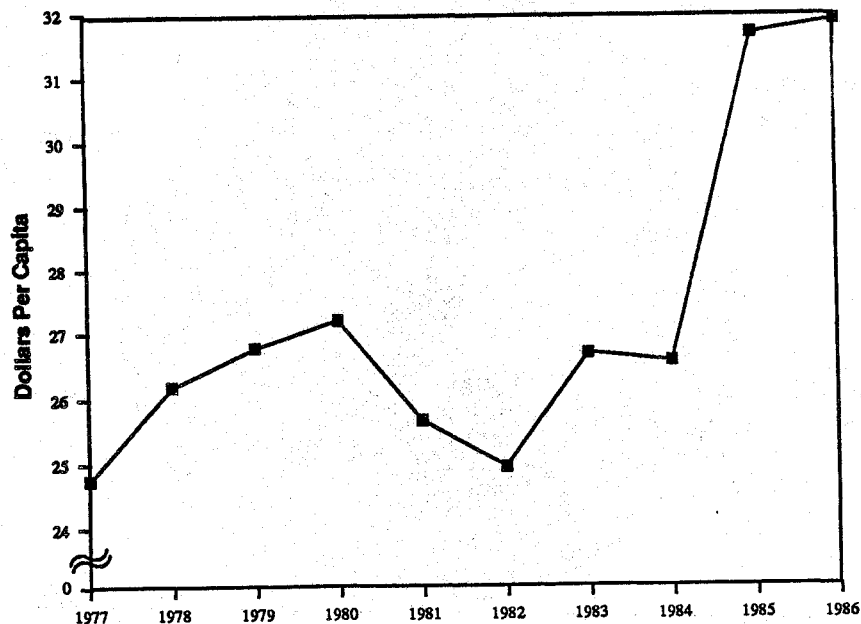
Figure 10. Real North Dakota County Per Capita Expenditures for Law Enforcement, 1977-1986.
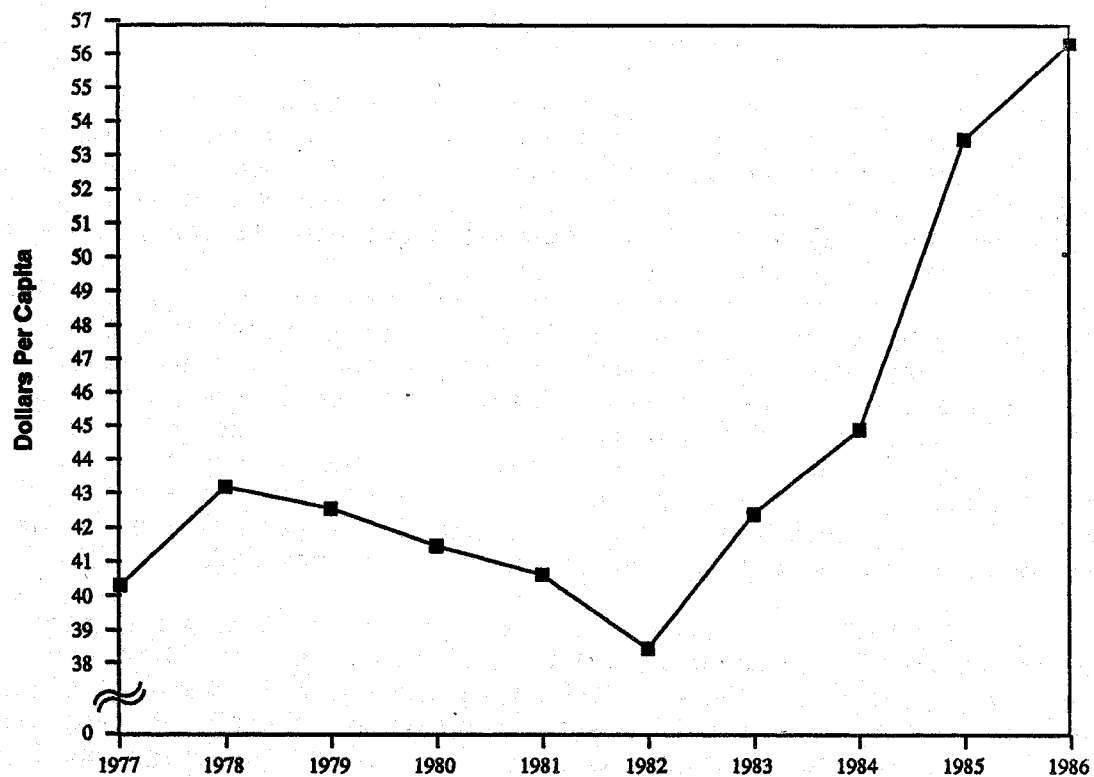
Figure 11. Real North Dakota County Per Capita Expenditures for Health and Human Services, 1977-1986.
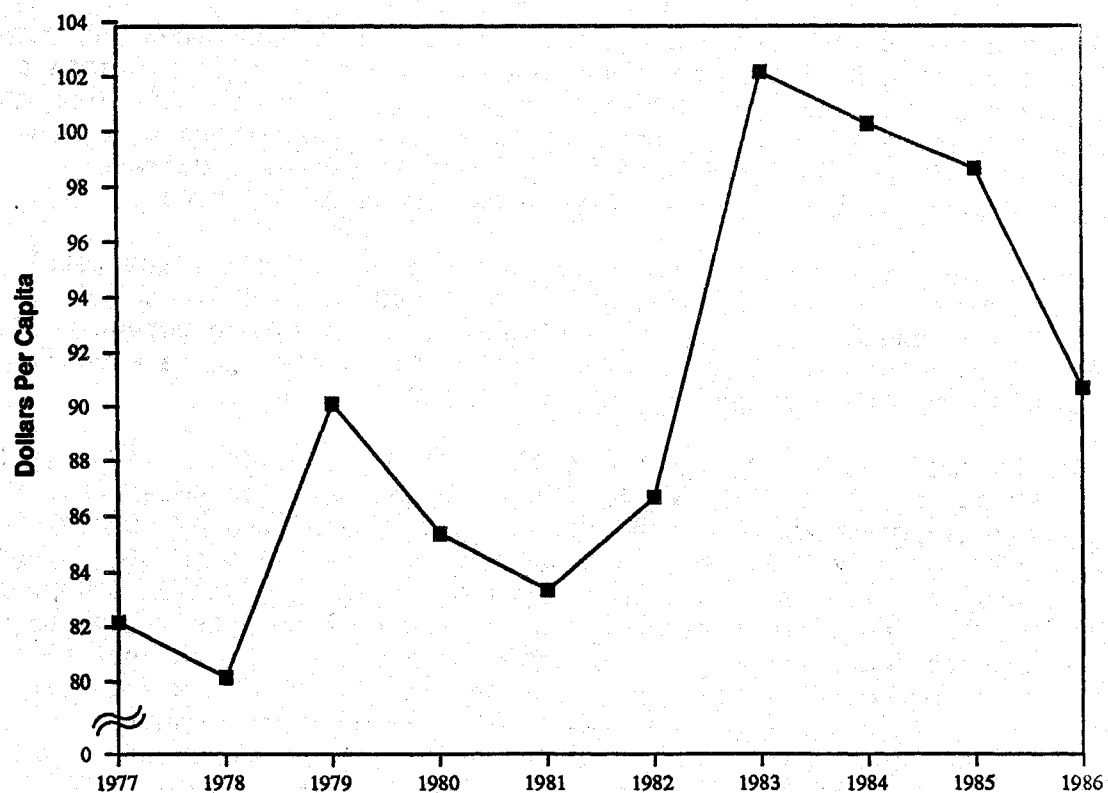
Figure 12. Real North Dakota County Per Capita Expenditures for Highways and Roads, 1977-1986.

County Spending Comparisons

Counties have been ranked according to average adjusted spending and per capita spending by category (Tables 5 and 6). Three counties with the highest and lowest average percent of total spending for general government, law enforcement, health and human services, and highways and roads from 1977 to 1986 are compared (Table 7). Most counties are closer to the average than those found in Table 7 (Appendix E).

Billings and McKenzie spent (as a percent of their total budgets) much less than the county average in general government and health and human services, but spent about three-quarters of their expenditures on highways and roads. Oliver county spent (as a percent of its total budget) over seven times more on highways and roads than on health and human services. Cass county spent much less on highways and roads but more than average on law enforcement. Sioux county spent over one-third of its expenditures on health and human services and less than average on highways and roads.

Per capita expenditures provide a common base for which to examine spending differences among counties. The first comparison examines per capita expenditures and county population. This analysis not only compares counties on a common basis but can indicate possible economies of scale or reduction in per capita expenses based on county population. A plot of average total per capita expenditures by population for all counties during 1977-1986 period does not provide much resolution among counties because Billings county, due to its high per capita expenditure, distorts the scale (Figure 13).

Slope and McKenzie counties are also noticeably higher than the other counties. Excluding Billings and Slope counties from the plot provides a more detailed look at the remaining counties (Figure 14). Removing Billings and Slope counties increases the vertical scale, allowing a pattern to emerge suggesting that as population increases, per capita expenses decrease. However, most North Dakota counties have populations under 10,000.

The possibility of economies of scale may exist with average total per capita expenditures for county populations of 2,000 to 10,000, excluding Billings, Slope, and McKenzie counties (Figure 15). A strong potential for economies of scale appears to exist for average total per capita expenditures in the county population range of 7,000 to 90,000 (Figure 16).

The vertical scale changed from $100 to $800 per capita in Figure 15 to $120 to $400 per capita in Figure 15. Changing the scale showed potential per capita savings approaching $100 per capita could be realized by raising the service population from 7,000 people to 25,000 people. Also, potential per capita savings may exist for increasing county population from 25,000 people to 60,000 people. However, raising or increasing service populations by those magnitudes is not practical, nor necessarily desireable. By increasing a service area to encompass more people, not necessarily a single county, economies of scale may be realized. Using average total per capita expenditures only suggested the possible existence of economies of scale, a closer examination using specific spending categories may reveal more practical implications.

TABLE 5. NORTH DAKOTA COUNTIES RANKED BY AVERAGE ADJUSTED SPENDING BY CATEGORY PER YEAR, 1977-1986[a]

	Highway & Road Services		Health & Human Services		General Government		Law Enforcement		Year-end Total	
Rank	County	Average Spending	County	Average Spending	County	Average Spending	County	Average Spending	County	Average Spending
1	Sioux[b]	$151805	Slope	$97797	Sioux	$152645	Slope	$57981	Sioux	$603544
2	Eddy	327105	Billings	124685	Sheridan	158514	Sioux	61315	Sheridan	931717
3	Logan[b]	390803	Golden Va	130760	Slope	176222	Sheridan	77602	Eddy	972782
4	Sheridan[b]	449267	Oliver	133723	Kidder	216250	Steele	81478	Slope	1018163
5	Kidder	452471	Renville	169889	Eddy	230305	Kidder	86366	Logan	1039813
6	Sargent	462601	Logan	179171	McIntosh	280063	Grant	89150	Kidder	1108087
7	Ransom	509690	Sheridan	181671	Renville	293532	McIntosh	91294	McIntosh	1230848
8	Foster	511504	Griggs	190815	Logan	293964	Logan	104594	Griggs	1286546
9	Hettinger	512635	Eddy	194128	Grant	313062	Bowman	104781	Foster	1287490
10	Griggs	530961	Sioux	197799	Emmons	317785	Renville	105153	Hettinger	1305081
11	Adams[b]	552195	Towner	201383	Foster	321086	Griggs	108365	Sargent	1363162
12	Steele	578560	Adams	202385	Divide	321307	Sargent	110337	Grant	1365079
13	Slope	583518	Bowman	204140	Griggs	326126	Oliver	110929	Adams	1431774
14	McIntosh[b]	584923	McIntosh	212912	Oliver	338121	Foster	112380	Burke	1445757
15	Pierce[b]	607951	Kidder	214251	Burke	339706	Eddy	115008	Renville	1495970
16	Grant[b]	633680	Hettinger	223309	Adams	345360	Hettinger	115114	Golden Va	1512959
17	Burke	659664	Divide	224296	Dickey	357366	Divide	122444	Towner	1566727
18	Golden Va[b]	677091	Burke	226350	Wells	366353	Towner	123328	Divide	1603368
19	Rolette[b]	683616	Grant	227184	Towner	369013	Wells	124327	Oliver	1628954
20	Towner	733394	Foster	241637	Hettinger	376571	Burke	138666	Steele	1656461
21	Wells	746167	La Moure	254012	Steele	385441	La Moure	160925	Ransom	1706361
22	Nelson	748195	Sargent	260406	Golden Va	391224	Dickey	163620	Wells	1715461
23	Divide	794497	Nelson	265751	Sargent	403516	Nelson	168257	Nelson	1746153
24	McHenry[b]	796813	Steele	283351	Ransom	435965	Emmons	168313	Dickey	1757707
25	Renville	803680	Emmons	287888	Billings	447833	McHenry	171907	Emmons	1787989
26	Dickey	821363	Mountrail	316490	Nelson	455606	Dunn	172488	Bowman	1851198
27	Mountrail	872555	McKenzie	323123	Pierce	458158	Billings	174980	Pierce	1882372
28	Emmons[b]	898390	Dickey	325940	La Moure	469390	Ransom	182881	La Moure	1997050
29	Bowman[b]	907172	Wells	364022	Dunn	484792	Golden Va	187584	Rolette	2051762
30	La Moure	959420	Dunn	382487	Benson	490529	Pierce	210497	Mountrail	2171389
31	Oliver	975867	McHenry	430744	Cavalier	506153	Benson	211898	McHenry	2208099
32	Cavalier	988682	Ransom	434161	Rolette	510557	Bottineau	227681	Cavalier	2412726
33	Benson[b]	1041244	Bottineau	447021	McHenry	515636	Adams	232092	Dunn	2493834
34	Pembina	1082316	Pierce	457665	Bowman	518245	Traill	234568	Traill	2575780
35	Ramsey	1138938	Traill	458268	Traill	547692	Cavalier	234875	Benson	2849668
36	Dunn[b]	1171381	Rolette	477339	Mountrail	561973	Rolette	265212	Bottineau	2884562
37	Traill	1203018	Cavalier	483859	Pembina	563593	Mountrail	298622	Pembina	3134070
38	Bottineau	1347583	Mercer	568317	Mercer	608407	Pembina	322749	Ramsey	3472036
39	Walsh	1414069	McLean	629789	Bottineau	677829	McKenzie	341928	Barnes	3482745
40	Barnes	1437269	Barnes	672581	McKenzie	786595	Barnes	377817	Billings	3804932
41	Stark[b]	1546275	Pembina	767772	Barnes	801817	Ramsey	421437	Mercer	3938124
42	Richland	1619886	Walsh	791964	McLean	806295	Walsh	435132	Walsh	4136096
43	Burleigh[b]	1770521	Stark	809405	Ramsey	826960	Richland	561580	Stark	4248252
44	Stutsman[b]	1816780	Richland	853727	Stutsman	855966	Stutsman	598260	McLean	4331281
45	GrandFor	1972025	Ramsey	906540	Stark	916107	Mercer	613826	Richland	4731704
46	Mercer	2010566	Benson	911876	Walsh	968506	McLean	615569	Stutsman	5358702
47	Williams[b]	2142903	Williams	1083030	Morton	1099752	Stark	664729	Burleigh	5779964
48	Morton[b]	2379885	Morton	1279140	Burleigh	1107092	Burleigh	868300	Williams	5862495
49	McLean	2496833	Stutsman	1492524	Richland	1114739	Williams	1103763	McKenzie	6160146
50	Cass	2611853	Burleigh	1699272	Williams	1297641	Morton	1179897	Morton	6297947
51	Ward	2698723	Grand For	1902870	Ward	1523189	Ward	1180458	Grand For	7560403
52	Billings[b]	2989168	Ward	2043109	Grand For	1912297	Grand For	1260083	Ward	8405580
53	McKenzie[b]	4500109	Cass	3343473	Cass	2146523	Cass	2333819	Cass	12519452
	Average	1156558		562004		594139		346912		2890006

[a]Adams, Bowman, Eddy, Grant, Kidder, McLean, and Sioux county averages based on less than ten years of data.
[b]Contain unorganized territories.

TABLE 5.   NORTH DAKOTA COUNTIES RANKED BY AVERAGE ADJUSTED SPENDING BY CATEGORY PER YEAR, 1977-1986 (CONTINUED)[a]

	Education		Emergency		Environment		Miscellaneous	
	County	Average Spending	County	Average Spending	County	Average Spending	County	Average Spending
Rank								
1	Kidder	$28650	Sheridan	$1348	Wells	$0	Bowman	$96
2	Grant	32154	Sioux	3020	Sioux	1997	Traill	238
3	Sioux	33203	Kidder	3560	Kidder	10938	Billings	451
4	Billings	35543	Renville	3654	Sheridan	11615	Oliver	884
5	Oliver	35555	Nelson	4959	Divide	14213	Hettinger	1003
6	Foster	36887	Mountrail	5333	Pierce	14872	McIntosh	1214
7	Towner	38064	Oliver	5637	Billings	15080	Grant	1507
8	Logan	38557	McIntosh	6112	Logan	15204	Sioux	1759
9	McIntosh	39081	Hettinger	6758	McIntosh	15250	Slope	1787
10	Eddy	39153	Slope	6947	Adams	17894	Sheridan	2157
11	Hettinger	40484	Logan	7879	Burke	19592	Rolette	3660
12	Golden Va	43498	Burke	8505	Nelson	20024	Pierce	3781
13	Burke	43570	Grant	8521	Sargent	20035	Mercer	5896
14	Dickey	46201	McLean	9125	Eddy	20765	Dickey	6995
15	Adams	49463	Ransom	9874	Slope	21998	Emmons	7795
16	Sheridan	49543	McKenzie	10740	Dickey	23677	Stark	8040
17	La Moure	50209	Griggs	11535	Steele	27783	Logan	9640
18	Nelson	52421	Emmons	11819	Oliver	28238	Burke	9703
19	Ransom	52876	Benson	12497	Griggs	28475	Sargent	10115
20	Mountrail	54618	Dickey	12545	Hettinger	29207	Towner	10426
21	Rolette	55787	Foster	13650	Rolette	29636	Williams	10838
22	Emmons	55919	Eddy	13931	Golden Va	31099	Griggs	12206
23	Wells	57966	Bowman	15074	Renville	31400	Kidder	13463
24	Ramsey	58808	Pierce	16807	Foster	33283	Ramsey	14566
25	Bowman	59144	Billings	17193	Ransom	34830	Benson	15293
26	Renville	61225	Mercer	17684	Mercer	35723	Steele	15574
27	McLean	61866	Towner	19904	Mountrail	37047	Foster	17062
28	Cavalier	66742	La Moure	20916	Bottineau	37897	Barnes	17395
29	McKenzie	67380	Traill	20974	La Moure	39868	McLean	21614
30	Divide	68591	Sargent	22014	Emmons	40080	Cavalier	22530
31	Traill	69605	Wells	22223	Traill	41419	Mountrail	24752
32	Slope	71913	Divide	24256	Bowman	42545	Golden Va	25539
33	Sargent	74137	Ramsey	24359	Barnes	43897	Renville	27437
34	Mercer	77706	Rolette	25955	McHenry	55084	Bottineau	28938
35	Griggs	78063	Golden Va	26166	Grant	59821	Nelson	30940
36	Bottineau	79986	Pembina	27676	Benson	66021	Eddy	32387
37	Steele	83299	Cavalier	35421	Stutsman	67806	Divide	33763
38	Dunn	84569	Bottineau	37627	Towner	71215	Wells	34403
39	Stark	89410	Dunn	38581	Williams	72373	Adams	35524
40	Burleigh	89702	Barnes	39057	Cavalier	74464	Dunn	36856
41	Barnes	92912	Adams	39476	Burleigh	75769	Pembina	37343
42	Benson	100310	Williams	42084	Ramsey	80428	Richland	41029
43	Williams	109864	McHenry	42388	McLean	80716	Morton	41489
44	Morton	111690	Walsh	45917	McKenzie	81604	La Moure	42310
45	Pierce	112640	Stutsman	53321	Pembina	114465	Grand For	45301
46	McHenry	117994	Ward	58275	Dunn	122680	Ransom	46083
47	Stutsman	152685	Stark	64119	Morton	136464	McKenzie	48668
48	Grand For	164907	Richland	65471	Stark	150166	Walsh	54688
49	Pembina	218156	Morton	69631	Grand For	152387	Burleigh	60233
50	Walsh	255071	Burleigh	109076	Richland	158755	McHenry	77533
51	Richland	316516	Grand For	150534	Ward	160133	Cass	126544
52	Ward	608033	Steele	200976	Walsh	170750	Ward	133661
53	Cass	1527625	Cass	235879	Cass	193736	Stutsman	321359
	Average	115848		34094		56234		30839

[a]Adams, Bowman, Eddy, Grant, Kidder, McLean, and Sioux county averages based on less than ten years of data.

TABLE 6. NORTH DAKOTA COUNTIES RANKED BY AVERAGE ADJUSTED PER CAPITA SPENDING BY
CATEGORY PER YEAR,1977-1986[a]

General Government		Law Enforcement		Health & Human Services		Highway & Road Services		Year-end Total	
County	Average Spending	County	Average Spending	County	Average Spending	County	Average Spending	County	Average Spending

Rank

1	Burleigh	$19.26	Burleigh	$15.48	Grand For	$28.38	Cass	$29.08	Burleigh	$101.92
2	Cass	23.61	Sioux	16.21	Burleigh	29.94	Grand Forks	29.47	Grand For	112.73
3	Ward	24.87	Wells	17.83	Stark	32.38	Burleigh	31.28	Ward	138.14
4	Grand Forks	28.52	Grand Forks	18.81	Ward	33.54	Sioux	40.17	Cass	139.51
5	Stutsman	35.97	McIntosh	19.38	Rolette	36.68	Ward	44.47	Rolette	158.85
6	Stark	36.76	Ward	19.40	Cass	37.03	Rolette	53.09	Sioux	159.97
7	Rolette	39.70	Sargent	20.08	Mountrail	39.54	Stark	61.79	Stark	169.42
8	Sioux	40.49	Rolette	20.48	La Moure	39.90	Ransom	75.40	Stutsman	225.33
9	Morton	43.47	Grant	20.82	McKenzie	41.47	Stutsman	76.31	Williams	241.04
10	Dickey	50.17	McHenry	21.82	Richland	43.79	Richland	83.32	Richland	243.48
11	Wells	52.66	Kidder	22.74	Williams	44.75	Sargent	84.17	Dickey	246.04
12	Williams	52.67	Dickey	22.82	McIntosh	45.50	Ramsey	87.11	Wells	246.66
13	Emmons	53.26	Foster	24.07	Dickey	45.81	Williams	89.67	Morton	248.23
14	Pembina	54.26	Bottineau	24.30	Renville	46.81	Walsh	89.88	Sargent	248.26
15	Mercer	54.72	Bowman	24.31	Bowman	47.34	Morton	93.73	Ransom	253.99
16	Sheridan	56.73	Traill	24.57	Sargent	47.64	Pierce	97.43	Barnes	254.21
17	Kidder	56.96	La Moure	25.16	Bottineau	47.83	Eddy	98.03	McIntosh	262.67
18	Traill	57.36	Stutsman	25.17	Towner	47.84	McHenry	100.83	Walsh	262.81
19	Richland	57.41	Cass	25.88	Traill	47.96	Pembina	104.25	Ramsey	265.85
20	Barnes	58.45	Steele	26.21	Emmons	48.16	Barnes	104.87	Traill	269.79
21	McIntosh	59.91	Stark	26.31	Barnes	49.09	Wells	107.33	Mountrail	271.37
22	Benson	61.09	Benson	26.38	McLean	50.05	Mountrail	109.06	Foster	276.36
23	Walsh	61.41	Ransom	27.12	Walsh	50.46	Foster	109.72	McHenry	279.22
24	Ramsey	63.42	Hettinger	27.32	Morton	50.46	Logan	111.87	Kidder	281.28
25	McLean	64.00	Sheridan	27.48	Mercer	50.62	Dickey	114.72	Eddy	292.24
26	Ransom	64.99	Barnes	27.60	Nelson	50.88	Kidder	119.00	Logan	295.82
27	McHenry	65.49	Walsh	27.60	Griggs	51.05	Hettinger	120.43	Emmons	299.01
28	Cavalier	66.68	Emmons	28.16	Logan	51.56	McIntosh	124.57	Pembina	301.81
29	Foster	69.01	Griggs	28.82	Golden Va	51.70	Traill	126.09	Pierce	303.25
30	Eddy	69.18	Richland	28.85	Foster	51.89	Benson	129.25	Hettinger	306.27
31	Mountrail	70.23	Renville	29.06	Oliver	52.02	Cavalier	129.42	Bottineau	308.30
32	Bottineau	72.37	Towner	29.25	Hettinger	52.32	Griggs	140.76	La Moure	313.35
33	La Moure	73.14	Logan	29.77	Wells	52.38	Nelson	142.55	Cavalier	318.51
34	Grant	73.22	Cavalier	30.98	Sioux	52.46	Bottineau	144.06	Grant	319.75
35	Sargent	73.73	Pembina	31.08	Grant	53.18	Grant	148.55	Sheridan	332.32
36	Pierce	74.41	Ramsey	32.20	McHenry	54.77	Emmons	149.97	Nelson	333.99
37	Renville	80.97	Nelson	32.22	Kidder	56.43	La Moure	150.99	Griggs	341.69
38	Logan	82.69	Pierce	34.23	Adams	56.91	Adams	155.22	McLean	345.26
39	Griggs	86.89	Divide	34.31	Eddy	58.30	Sheridan	160.01	Benson	354.49
40	Towner	87.20	Eddy	34.60	Burke	58.52	Burke	170.90	Mercer	356.51
41	Burke	87.69	Dunn	34.87	Stutsman	62.74	Towner	174.49	Towner	371.94
42	Nelson	87.69	Burke	35.98	Divide	62.75	Mercer	182.45	Burke	374.26
43	Hettinger	88.09	Mountrail	37.35	Cavalier	64.40	Steele	185.52	Adams	398.86
44	Divide	89.84	Oliver	43.24	Ransom	64.78	McLean	196.77	Renville	412.62
45	McKenzie	96.78	McKenzie	43.44	Sheridan	65.18	Bowman	210.17	Bowman	429.25
46	Adams	97.09	Williams	44.62	Ramsey	69.44	Divide	220.84	Divide	446.56
47	Dunn	98.69	Morton	46.41	Pierce	73.53	Renville	221.70	Dunn	506.09
48	Bowman	120.31	Slope	48.49	Pembina	74.01	Dunn	236.84	Steele	529.42
49	Steele	123.60	McLean	48.78	Dunn	77.88	Golden Va	263.41	Golden Va	591.14
50	Oliver	132.12	Mercer	55.87	Slope	81.41	Oliver	377.37	Oliver	631.89
51	Slope	146.47	Adams	65.36	Steele	90.69	Slope	490.62	McKenzie	759.25
52	Golden Va	152.72	Golden Va	73.59	Billings	102.03	McKenzie	551.27	Slope	851.96
53	Billings	361.16	Billings	141.20	Benson	113.70	Billings	2378.84	Billings	3039.60
	Average*	46.71		27.29		44.50		90.23		228.96

[a]Adams, Bowman, Eddy, Grant, Kidder, McLean, and Sioux county averages based on less than ten years of data.

*Weighed using county population as weighing factor.

TABLE 6. NORTH DAKOTA COUNTIES RANKED BY AVERAGE ADJUSTED PER CAPITA SPENDING BY CATEGORY PER YEAR, 1977-1986[a] (CONTINUED)

	Education		Emergency		Environment		Miscellaneous	
Rank	County	Average Spending	County	Average Spending	County	Average Spending	County	Average Spending
1	Burleigh	$1.61	Sheridan	$0.48	Wells	$0.00	Bowman	$0.02
2	Grand Forks	2.46	Mountrail	0.67	Sioux	0.53	Traill	0.02
3	Stark	3.65	McLean	0.72	Burleigh	1.31	Hettinger	0.25
4	Rolette	4.34	Sioux	0.81	Cass	2.14	McIntosh	0.27
5	Morton	4.41	Nelson	0.93	Grand Forks	2.22	Rolette	0.28
6	Ramsey	4.49	Kidder	0.94	Rolette	2.27	Stark	0.30
7	Williams	4.57	Ward	0.96	Pierce	2.54	Oliver	0.33
8	McLean	4.90	Renville	1.00	Ward	2.60	Grant	0.35
9	Stutsman	6.44	McIntosh	1.34	Williams	2.72	Billings	0.39
10	Dickey	6.45	Mckenzie	1.42	Mercer	2.82	Williams	0.40
11	Barnes	6.78	Ransom	1.49	Stutsman	2.86	Sioux	0.47
12	Mountrail	6.83	Benson	1.54	Kidder	2.88	Pierce	0.61
13	Traill	7.28	Mercer	1.54	Barnes	3.26	Mercer	0.61
14	Grant	7.52	Hettinger	1.55	Dickey	3.36	Grand Forks	0.67
15	Kidder	7.54	Williams	1.65	McIntosh	3.37	Sheridan	0.79
16	La Moure	7.86	Dickey	1.72	Sargent	3.59	Dickey	1.00
17	Mercer	7.88	Ramsey	1.86	Nelson	4.01	Burleigh	1.06
18	Foster	7.89	Emmons	1.90	Bottineau	4.07	Ramsey	1.13
19	Ransom	7.89	Burleigh	1.99	Divide	4.19	Emmons	1.30
20	Wells	8.29	Grant	2.00	Logan	4.31	Barnes	1.32
21	McIntosh	8.33	Rolette	2.01	Traill	4.32	Cass	1.41
22	Bottineau	8.55	Logan	2.11	Sheridan	4.37	Slope	1.49
23	McKenzie	8.66	Burke	2.15	Mountrail	4.62	Morton	1.59
24	Sioux	8.84	Traill	2.19	Adams	5.04	McLean	1.76
25	Cavalier	8.86	Oliver	2.20	Burke	5.15	Sargent	1.84
26	Towner	8.99	Grand Forks	2.21	Ransom	5.28	Benson	1.93
27	Emmons	9.34	Stutsman	2.24	Morton	5.35	Richland	2.13
28	Hettinger	9.45	Cass	2.67	Stark	5.52	Ward	2.20
29	Nelson	10.04	Pembina	2.68	Ramsey	6.20	Towner	2.48
30	Ward	10.12	Pierce	2.70	Eddy	6.29	Logan	2.51
31	Logan	10.99	Stark	2.72	La Moure	6.32	Burke	2.61
32	Burke	11.28	Morton	2.80	McLean	6.51	Mountrail	3.09
33	Eddy	11.72	Barnes	2.85	Hettinger	6.86	Bottineau	3.12
34	Benson	12.34	Walsh	2.89	Emmons	6.93	Cavalier	3.22
35	Sargent	13.15	Foster	2.90	Foster	7.21	Griggs	3.32
36	Bowman	13.74	Griggs	3.09	McHenry	7.24	Walsh	3.48
37	Adams	13.86	Wells	3.20	Griggs	7.61	Kidder	3.55
38	Oliver	13.86	La Moure	3.25	Richland	8.18	Pembina	3.62
39	McHenry	14.62	Richland	3.35	Benson	8.26	Foster	3.68
40	Walsh	16.11	Bowman	3.50	Renville	8.67	Steele	4.95
41	Richland	16.44	Bottineau	4.00	Steele	8.85	Wells	4.97
42	Renville	16.84	Sargent	4.05	Bowman	9.85	Nelson	5.66
43	Golden Va	17.17	Eddy	4.24	McKenzie	10.12	McKenzie	6.09
44	Sheridan	17.28	Cavalier	4.56	Cavalier	10.38	La Moure	6.73
45	Dunn	17.48	Towner	4.73	Oliver	10.76	Ransom	7.04
46	Cass	17.71	McHenry	5.18	Walsh	10.99	Dunn	7.45
47	Pierce	17.80	Slope	5.49	Pembina	11.02	Renville	7.55
48	Divide	18.46	Divide	7.01	Billings	11.90	Divide	9.16
49	Griggs	20.15	Dunn	7.82	Golden Va	12.20	McHenry	9.28
50	Pembina	20.90	Golden Va	10.27	Grant	14.12	Eddy	9.90
51	Steele	25.79	Adams	10.99	Towner	16.96	Adams	9.98
52	Billings	29.51	Billings	14.57	Slope	18.33	Golden Va	10.08
53	Slope	59.66	Steele	63.81	Dunn	25.08	Stutsman	13.60
	Average*	9.24		2.72		4.42		2.44

[a]Adams, Bowman, Eddy, Grant, Kidder, McLean, and Sioux county averages based on less than ten years of data.
*Weighed using county population as weighing factor.

TABLE 7.   COUNTIES WITH THE HIGHEST AND LOWEST AVERAGE PERCENT OF THEIR
BUDGETS IN THE FOUR MAJOR CATEGORIES, 1977-1986

Highest		Statewide Average	Lowest	
County	Percent	Percent	County	Percent
General Government				
Sargent	29.6		Billings	11.8
Hettinger	28.9	20.5	McKenzie	12.8
Logan	28.3		Mercer	15.5
Law Enforcement				
Williams	18.8		Billings	4.6
Morton	18.7	12	Steele	4.9
Cass	18.6		Bowman	5.7
Health and Human Services				
Sioux	32.3		Billings	3.3
Benson	32.0	19.5	McKenzie	5.3
Burleigh	29.4		Oliver	8.2
Highways and Roads				
Billings	78.6		Cass	20.9
McKenzie	73.1	39.7	Sioux	25.2
Oliver	59.9		Grand Forks	26.1
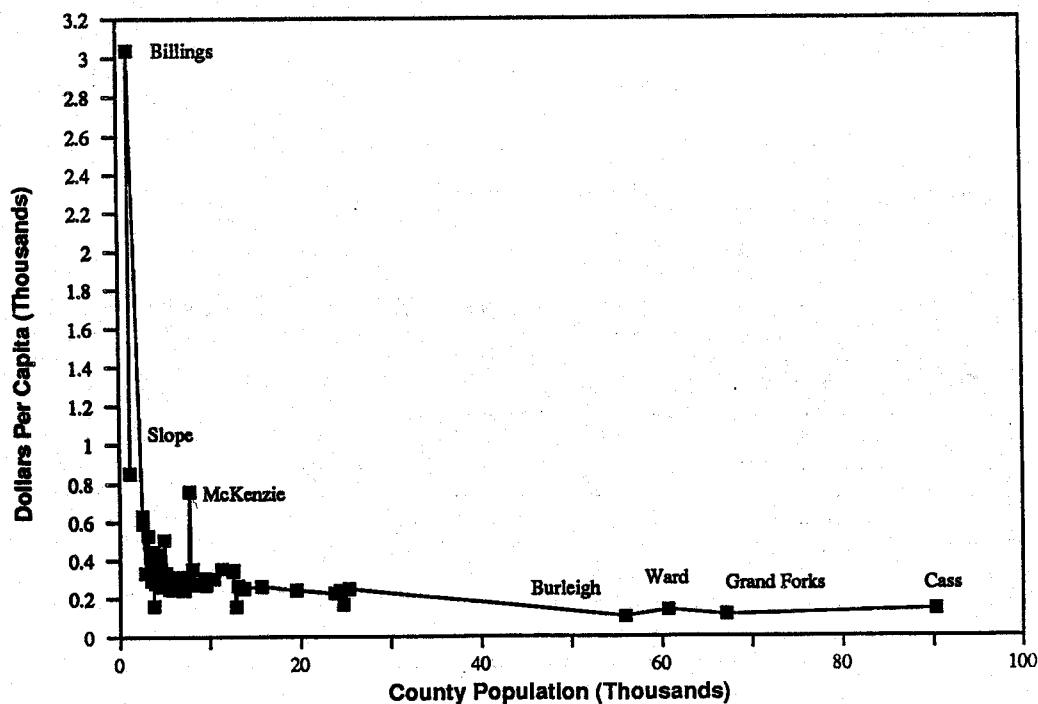
Figure 13.   Average Total Per Capita County Expenditures by Average County
Population, North Dakota, 1977-1986.
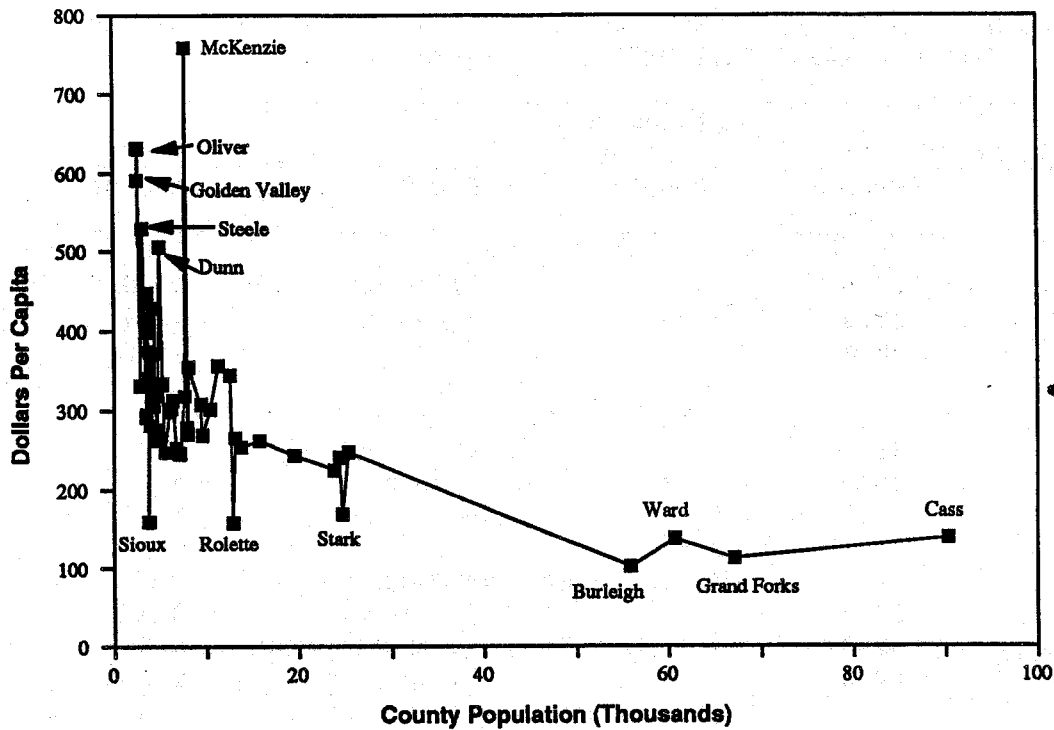
Figure 14. Average Total Per Capita County Expenditures by Average County Population, Excluding Billings and Slope Counties, North Dakota, 1977-1986.
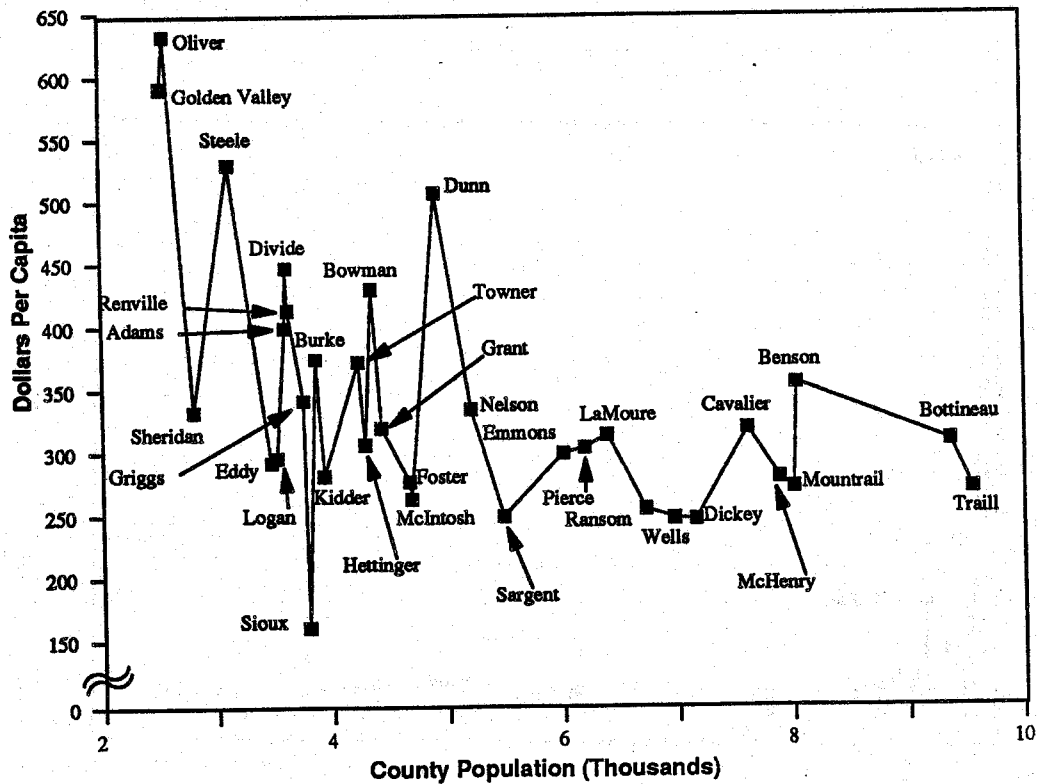
Figure 15. Average Total Per Capita County Expenditures by Average County Population, Excluding Billings, Slope, and McKenzie Counties, Population 2,000 to 10,000, North Dakota, 1977-1986.
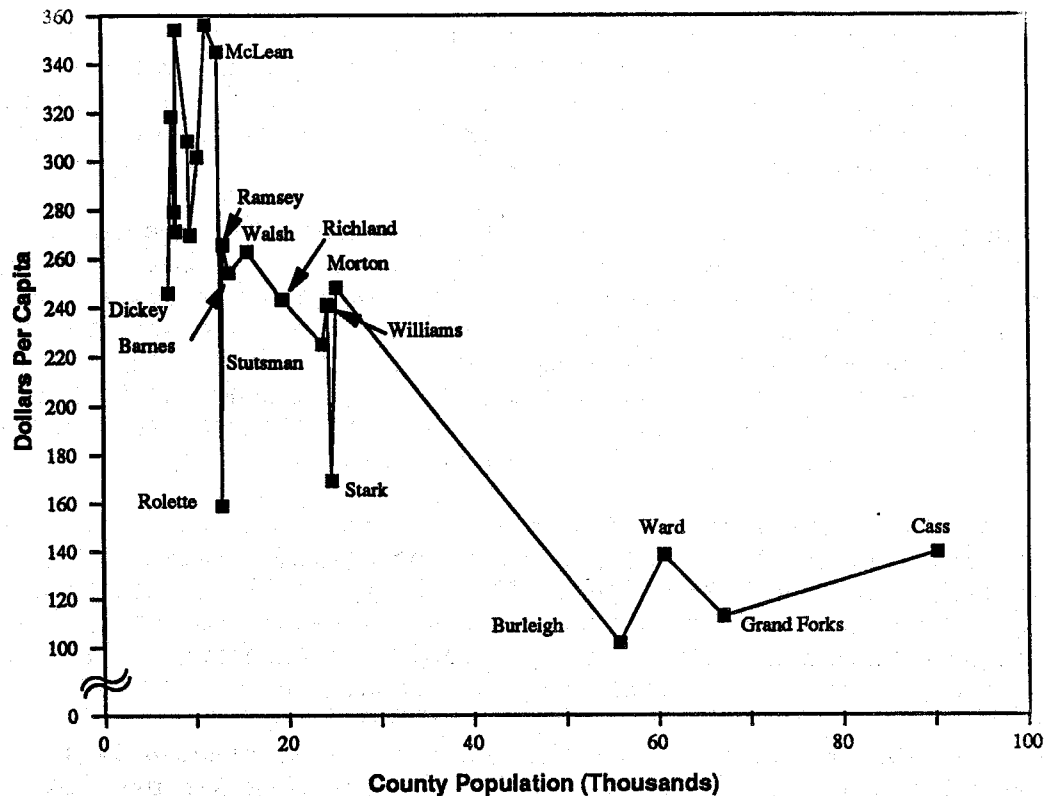
Figure 16. Average Total Per Capita County Expenditures by Average County Population, Excluding McKenzie County, Population 7,000 to 100,000, North Dakota, 1977-1986.

Average per capita expenditures for general government, law enforcement, health and human services and highways and roads were examined in the same manner as average total per capita expenditures. General government and highways and roads appear to have the most potential for capturing economies of scale (Appendix F). Law enforcement and health and human services did not provide a clear pattern, suggesting some potential for economies of scale (Appendix F). The greatest potential (involving number of counties) to capture economies of scale in providing general government services lies with counties between 4,000 to 25,000 population. Thirty dollars per capita might be realized by increasing the service area from 4,000 people to approximately 16,000 to 25,000 people. Potential savings appear greatest for highways and roads with service areas from 6,000 to 60,000 people. Per capita expenditures for highways and roads continued to decline as county population increased, suggesting the existence of economies of scale.

The existence of economies of scale may help all counties decide on a broader plan for service delivery, since most economies of scale savings result from increasing service populations. Increasing the service population by increasing county population is not feasible and is beyond the direct control of policy makers. Increasing the service population would require joint effort of two or more counties. This approach may help service areas achieve lower per capita costs; however, this would require inter-county cooperation, which may or may not be accepted by government officials and

county taxpayers. Another approach to improving per capita costs would be to examine the delivery methods of lower-than-average per capita cost counties. Adopting other counties' delivery methods (or service levels) could improve individual county service delivery without the complexities of inter-county cooperation and/or increasing county population.

Frequency distribution graphs can be used to show where the majority of counties are in relation to the lowest and highest per capita cost counties. These graphs show the potential number of counties outside the average that may benefit by adopting cost saving measures. The following graphs (Figures 17-20) show the frequency distributions of ten-year average per capita county expenditures in the four major spending categories. Frequency distribution graphs for education, emergency, environment, and miscellaneous services have patterns similar to those found in the four major categories (Appendix G).

One county has per capita general government expenditures averaging under $20 whereas five counties have per capita general government expenditures averaging over $120 (Figure 17). The remaining 47 counties range from above $20 to under $100 per capita. With the exception of six counties, the remaining 47 counties are within $80 per capita of each other. This indicates a fairly narrow range of per capita expenditures.

No counties had per capita law enforcement costs substantially lower than the average (Figure 18). However, three counties were $25 per capita higher than the majority of counties.
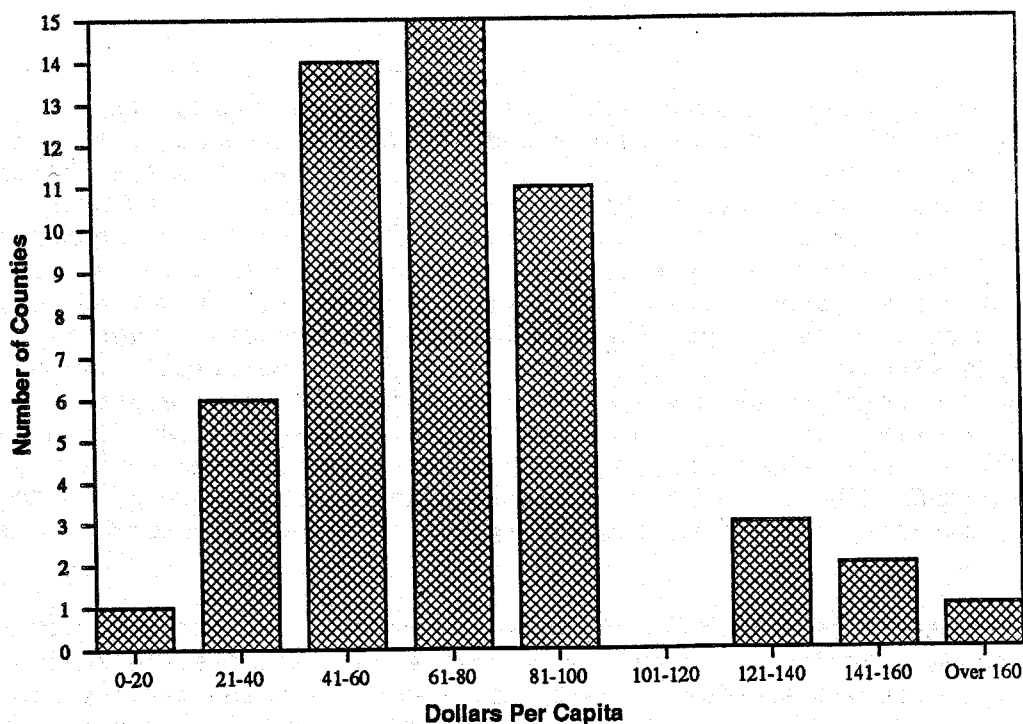

Figure 17. Distribution of Average Per Capita County Expenditures for General Government Services, North Dakota, 1977-1986.
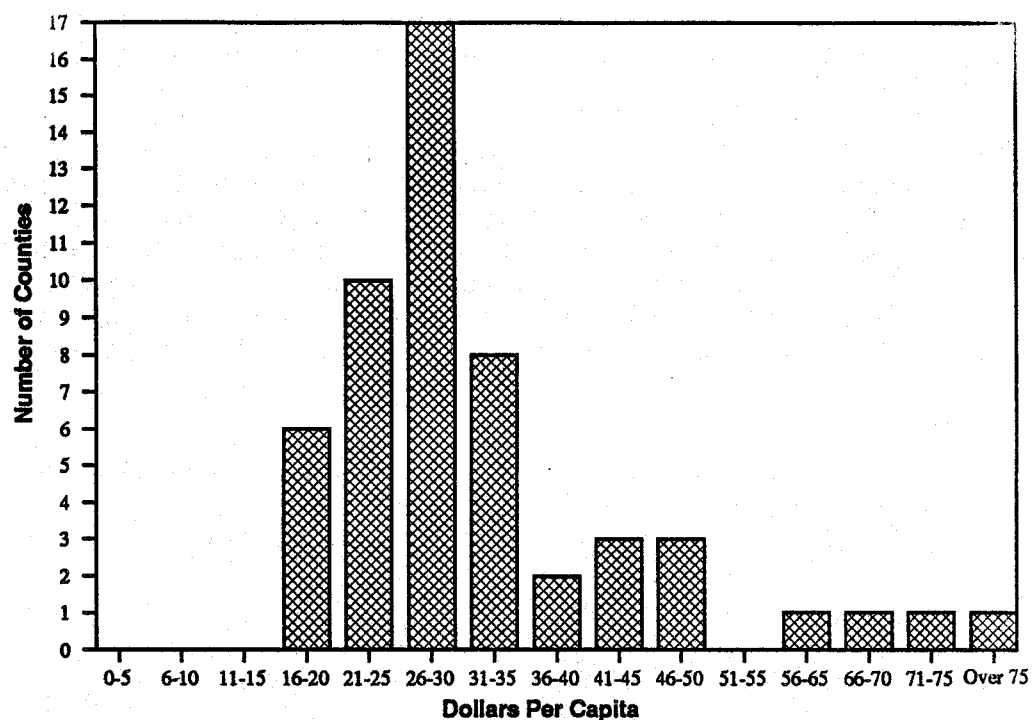
Figure 18. Distribution of Average Per Capita County Expenditures for Law Enforcement Services, North Dakota, 1977-1986.
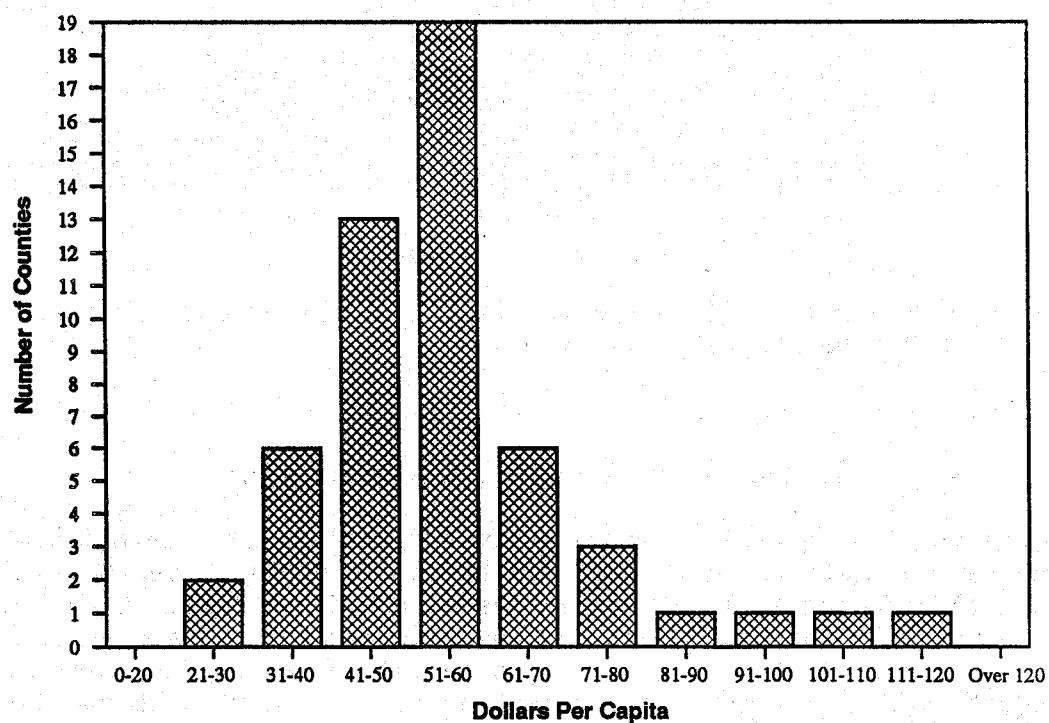

Figure 19. Distribution of Average Per Capita County Expenditures for Health and Human Services, North Dakota, 1977-1986.

The distribution for per capita spending on health and human services shows two counties were lower than the majority of counties (44 counties within $40 per capita of each other), however, five counties were higher than the majority (Figure 19).

The distribution for per capita spending on highways and roads shows a wide range of average per capita costs suggesting there is more variation in the delivery of highways and roads services (Figure 20). Possible explanations may exist with the combination of county size, road miles, vehicle miles traveled, and county population. Counties with high population and small land area (high population density) might have lower per capita costs, whereas, the opposite may exist with low population counties.
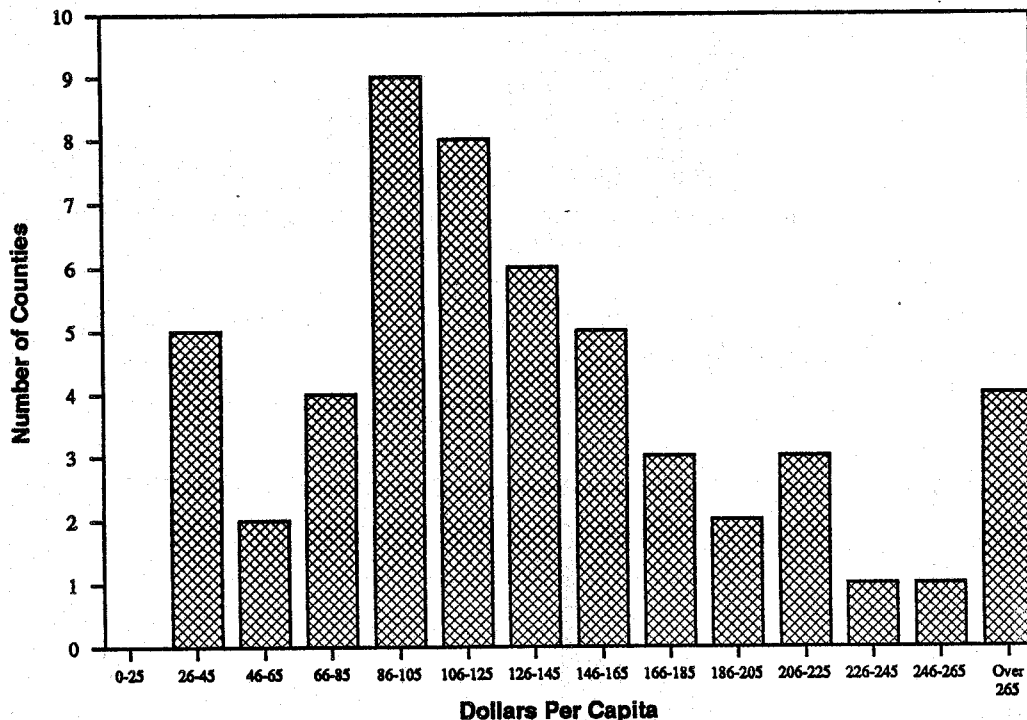
Figure 20. Distribution of Average Per Capita County Expenditures for Highway and Roads, North Dakota, 1977-1986.

Influences on Percent Spent by Category

Comparing the percent of total spending for the major categories with land area may indicate the need (or lack there of) for counties to increase (or decrease) spending as land area increases (or decreases). Land area and the percent of total budgets spent on general government appear to be inversely related. That is, as land area served increases, the percent of total budgets spent on general government decreases. Land area had little effect on the percent of total budgets spent on law enforcement, health and human services, and highways and roads (Appendix H).

The correlation between the percent of total budgets spent on general government and county land area was the strongest of the four major categories (Table 8). Although patterns between the remaining three major categories were similar, correlation coefficients indicate the relationship has very little significance.

TABLE 8. CORRELATION COEFFICIENTS FOR COUNTY LAND AREA AND THE PERCENT OF INDIVIDUAL COUNTY BUDGETS SPENT ON GENERAL GOVERNMENT, LAW ENFORCEMENT, HEALTH AND HUMAN SERVICES, HIGHWAYS AND ROADS, NORTH DAKOTA, 1977-1986

Spending Category Percent of Total	Correlation Coefficient[a] With Land Area
General Government	-0.331
Law Enforcement	0.228
Health and Human Services	0.068
Highways and Roads	0.047

[a]Determined by using Pearson product-moment correlation on statistical analysis system.

Of the four major categories, law enforcement and general government expenditures as a percent of total expenditures had the highest correlations (Table 9). General government expenditures as a percent of total budgets appears to decrease as population increases. Health and human services as a percent of total expenditures increase as county population increases. Highways and roads as a percent of total budgets appears to decrease with increases in population. Graphs showing the relationship between population and percent of total expenditures spent by category are contained in Appendix I.

Correlation analysis indicates a negative relationship between the percent of budgets spent on general government and highways and roads and population. A strong relationship exists between the percent of budgets spent on law enforcement and population, suggesting population may have a substantial impact on how much of a county's total budget was spent for law enforcement. These relationships do not support any interrelationships between land area, population, or other county characteristics.

TABLE 9. CORRELATION COEFFICIENTS FOR COUNTY POPULATION
AND THE PERCENT OF INDIVIDUAL COUNTY BUDGETS SPENT ON
GENERAL GOVERNMENT, LAW ENFORCEMENT, HEALTH AND HUMAN
SERVICES, HIGHWAYS AND ROADS, NORTH DAKOTA, 1977-1986

Spending Category Percent of Total	Correlation Coefficient[a] With Population
General Government	-0.167
Law Enforcement	0.581
Health and Human Services	0.411
Highways and Roads	-0.420

[a]Determined by using Pearson product-moment correlation on
Statistical Analysis System.

Revenue Sources

Local governments received 46 percent of their revenue from
intergovernmental aid, 27.5 percent from property taxes, and 26.5 percent from
miscellaneous sources, in 1982 (Figure 21). In 1986, local governments
received 44.9 percent of their revenue from intergovernmental sources, 33.6
percent from property taxes, and 21.5 percent from miscellaneous sources.
However, in 1986, federal aid accounted for 7.2 percent of all local
governments' revenue. Federal revenue sharing was discontinued on October 1,
1987, forcing local governments to find alternative sources to replace these
funds. State aid accounted for 44 percent of total revenue in 1982 compared
to 37.7 percent in 1986.

The availability of state aid is dependent on state revenue collections.
North Dakota's economy and tax collections are highly dependent on agriculture
and energy. In recent years, state collections of energy taxes declined along
with energy revenue (Dorow 1988). Since state aid as a percent of total
revenue has been decreasing and property tax revenue is limited by state law,
the greatest potential for increasing revenue lies with other sources, or with
changes in legislation. Currently, county revenue sources include
intergovernmental aid; taxes; licenses, permits, and fees (LPF); fines and
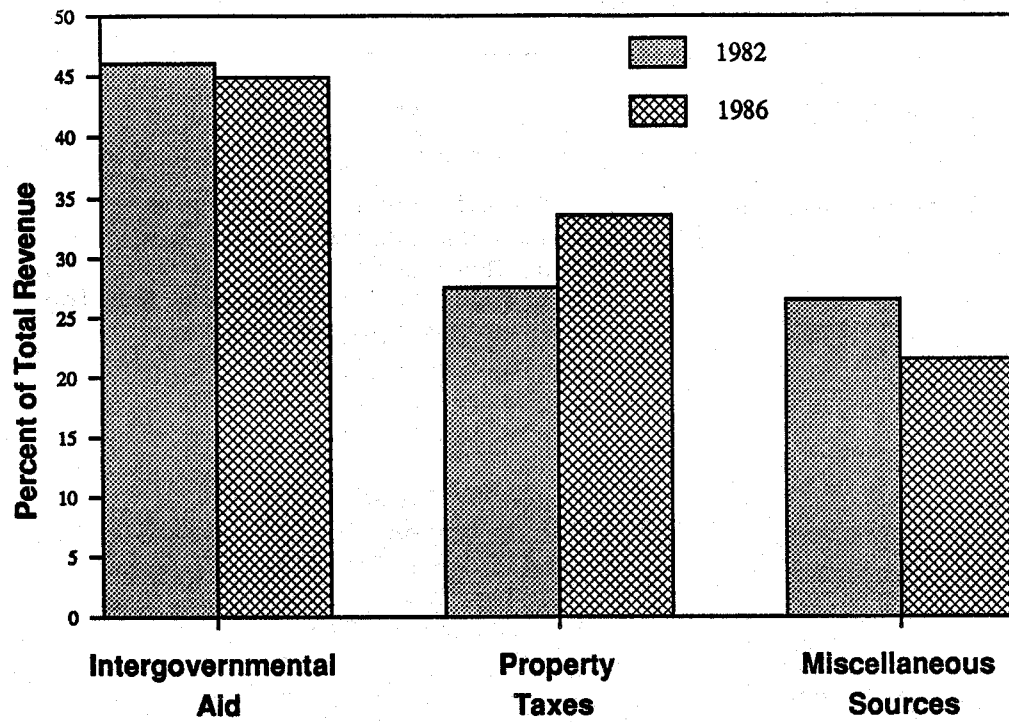forfeits (FF); charges for services; and miscellaneous sources (Table 10).

Figure 21. Revenue by Source for Local Governments in North Dakota, 1982 and 1986.

Source: The Farmers' Forum, page 14, June 12, 1987.

TABLE 10. AGGREGATED REVENUE CATEGORIES AND CORRESPONDING ITEMIZED REVENUE ITEMS FOR NORTH DAKOTA COUNTIES,[a] 1985 AND 1986.

Revenue Category	Revenue Items
1. Intergovernmental Sources	Personal Property Replacement Homestead Credit Coal Severance State and Federal Revenue Sharing Gas and Oil Production Energy Impact Grants Highway Tax Distribution Transmission Lines
2. Taxes	Property Taxes Estate Taxes Mobile Home Taxes Utility Taxes Miscellaneous Taxes
3. Charges for Services	Court Costs Register of Deeds Assessing Charges Contract Sheriff Services Weed (Spraying) and Bait Road Work and Snow Removal Social Service Charges
4. Licenses, Permits, and Fees	Day Care, Beer and Liquor, Chemical and Pesticide, and Marriage Licenses Pistol, Drilling, Fireworks, Raffle, and Building Permits Leasing and Camping Fees
5. Fines and Forfeits	Court Fines and Costs
6. Miscellaneous Sources	Interest, Rent, Land Leases, Sale of Property, Vending and Concessions, Insurance Reimbursement, and Others

[a]Determined by examining North Dakota county revenue records.

County revenue data for 1985 and 1986 were collected along with county expenditures. Counties received the biggest share of their revenue in 1985 and 1986, from intergovernmental transfers (Figure 22).
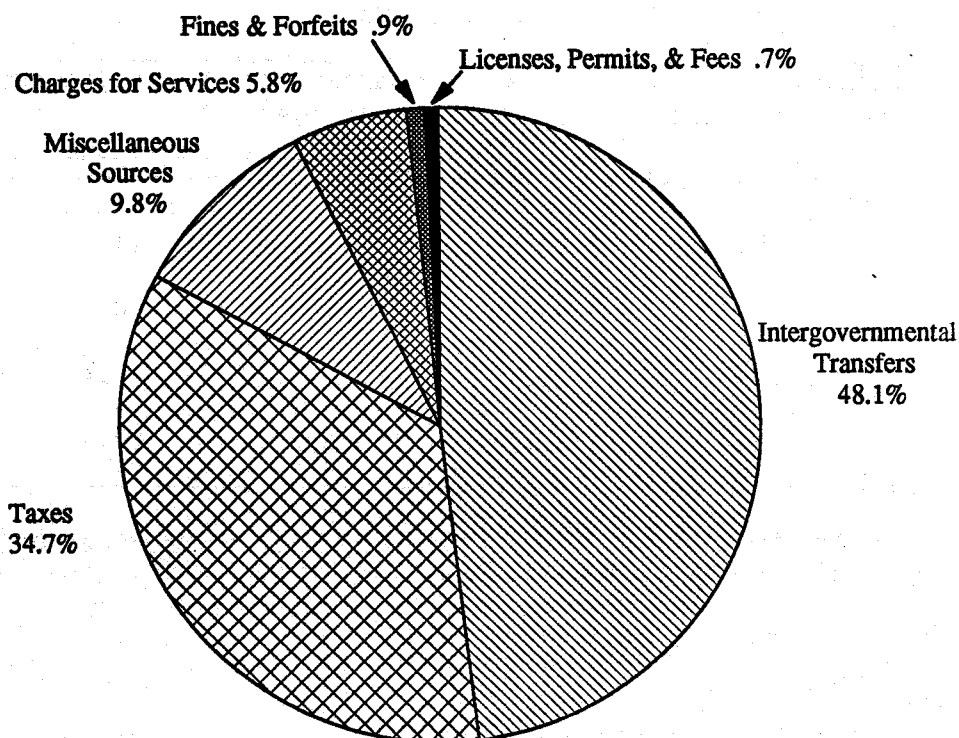

Figure 22. North Dakota County Revenue by Source, 1985 and 1986.

North Dakota counties received about 83 percent of their revenue from intergovernmental transfers and taxes in 1985 and 1986. Montana, South Dakota, Minnesota, and Wyoming counties received about 78, 83, 80, and 56 percent of their revenue from intergovernmental transfers and taxes, respectively, (Table 11). Although Montana, South Dakota, and Minnesota counties receive about an equivalent percentage of their revenue from the same sources as North Dakota, the reliance on those sources varies. For example, Montana counties are highly dependent upon taxes and Minnesota counties are highly dependent on intergovernmental transfers, as compared to North Dakota counties.

TABLE 11. PERCENT OF REVENUE BY SOURCE FOR MONTANA, SOUTH DAKOTA, MINNESOTA, AND WYOMING COUNTIES, 1985-1986.

	Revenue Sources				
State	Intergovernmental Transfers	Taxes	Charges for Services	Miscellaneous	Total
	(----------------------------- Percent ----------------------------)				
Montana	16.1	61.6	11.3	11.0	100
South Dakota	28.6	54.8	6.6	10.0	100
Minnesota	51.3	28.8	12.5	7.4	100
Wyoming	23.2	32.5	21.2	23.1	100

Source: Bureau of the Census. 1986. Government Finances in 1985-1986, Series GF-86, No. 5, U.S. Government Printing Office, Washington, D.C.

Statistical Analysis

The following sections contain results of statistical analyses of county expenditures on highway and roads, health and human services, law enforcement, and general government services. The four largest expenditure categories were examined in detail, in an attempt to understand and explain spending levels across counties. Various analytical techniques were used to help explain county spending. However, unless otherwise noted, only results from linear regression analyses are reported. Independent variables significant at the 90 percent or higher level were retained in the regression models.

Highways and Roads

Expenditures for highways and roads comprised 40 percent of all county spending during 1977 through 1986. Explaining factors affecting highway and road expenditures is important for both county government and taxpayers' interest because of the relative importance of highways and roads.

Spending on highways and roads varies considerably across counties (Table 5, page 34). Due to large fluctuations among counties and the relatively large portion of expenditures on highways and roads, many factors exist influencing these different levels. Identifying these factors may help explain variations in service delivery.

Intuitively, highway and road expenditures should be a function of some or all of the following:

mileage of roads serviced,
mileage of new construction,
cost of road materials,
number of bridges serviced,
level of road ditch weed control,
amount and age of equipment,
number and cost of personnel,
amount of travel on county roads,
influences of weather,
level of technology, and
in-house production or other provision of services.

Most of the above variables could be used to examine highway and road expenditures; however, quantitative measures for most of the above variables are not generally available.

Highway and road expenditures can be analyzed two ways, cost per mile serviced and per capita cost. The first measures the dollars spent per mile of road under county control. The second expresses highway and road expenditures on a per-person basis. Sioux and McKenzie counties had the lowest and highest average highway and road costs per mile serviced during the period 1977-1986, respectively (Figure 23).
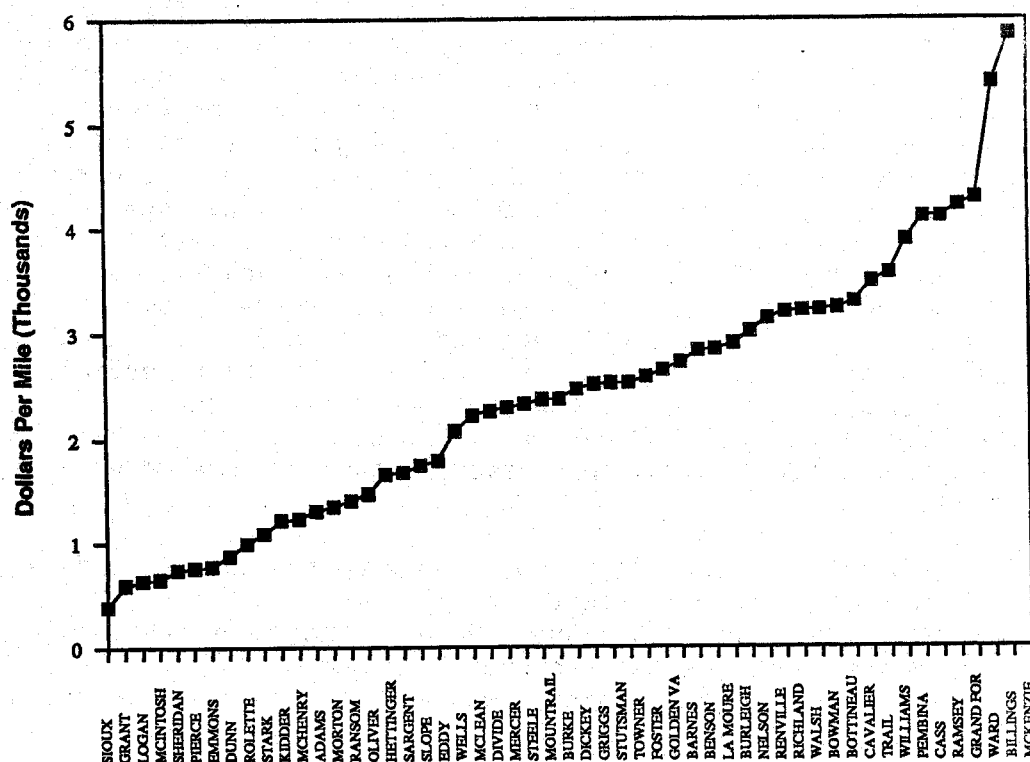
Figure 23. North Dakota Counties' Average Highway and Road Costs Per Mile Serviced, 1977-1986.

Cost per mile serviced was determined by dividing total highway and road expenditures per year by the mileage of roads under county control and then computing an average. County highway departments usually maintain roads in unorganized territories and also provide some road services for townships. These services can inflate a county's highway and road expenditures, even though the county may receive revenue for these operations. Sioux county had the lowest average cost per mile with $392. McKenzie county was the highest, spending an average of $5859 per mile. The statewide county average, weighted by roads under county control, was $2151 per mile.

The five highest and lowest per capita cost counties were examined in closer detail (see Table 6 for a ranking of average per capita highway expenditures). Cass, Grand Forks, Burleigh, Sioux, and Ward counties had the lowest per capita highway costs. Billings, McKenzie, Slope, Oliver, and Golden Valley counties had the highest per capita costs, reflecting low populations and high costs to maintain roads to support energy development. Cass, Grand Forks, Burleigh, and Ward counties are low per capita cost counties because they contain large populations. Even if they had high costs per mile of roads serviced, highly populated counties result in low per capita costs. Sioux county may appear to be a low cost county based on per capita costs; however, from Figure 23 it can be seen that their average cost per mile was extremely low. This suggests that Sioux county may not be providing the same level of highway services found in the other low cost counties.

Unlike the five low cost counties, the five high cost counties do not have large populations. Billings, McKenzie, Slope, Oliver, and Golden Valley were ranked lowest, thirty-second, second to lowest, fourth, and third, respectively, based on average population between 1977-1986. The low populations in Billings and Slope counties may explain why they have such high per capita costs. Oliver and Golden Valley counties had low populations also, but were approximately double those of Billings and Slope counties. Obviously, population has much to do with explaining per capita costs; however, Billings and McKenzie also had the highest average cost per mile of roads serviced (Figure 22). The third and fourth highest average cost per mile of roads serviced were Ward and Grand Forks counties, respectively. This is reasonable considering that those counties had relatively large populations, leading to more intensive use of county roads. However, other reasons must exist explaining why Billings and McKenzie had such high average cost per mile of road serviced. Most influential is the high cost of maintaining a road system for energy exploration and exploitation. In an attempt to explain why many of the western counties appear to be high cost counties, even though having small populations, other factors were investigated.

The five highest per capita cost counties were ranked third, first, sixteenth, twenty-sixth, and seventeenth, respectively, based on total intergovernmental revenue from 1985-1986. Much of the money spent on highways and roads is from intergovernmental transfers. Based on total revenue, the same counties were ranked eighth, third, twenty-ninth, thirty-seventh, and twenty-eighth, respectively.

Counties' expenditures were examined further using regression analysis. Variables included mileage of roads under county control, mileage of state highway systems (including interstate, primary, and secondary highways),

mileage of all county and township roads and streets, and annual motor vehicle travel miles in rural areas. The values for mileage of roads under county control and mileage of all county and township roads and streets were from 1976. Estimates of the mileage of roads under county control and all county and township roads and streets for 1977-1986 were not available, so 1976 figures were used. The mileage of county and township roads was assumed constant from 1977-1986, and if mileage changed, the same change was assumed in all counties. Mileage of state highway systems was available only for 1977, 1979, and 1980. A similar assumption was made regarding changes in the mileage of state highway systems, thus the value in 1977 was used in 1978 and the value in 1980 was used for 1981-1986. Estimates of annual vehicle travel miles were not available for 1981-1983, and 1986. Other variables used in the analysis included land area, county population, and density (people per square mile).

Ordinary least squares regression was used to identify variables that significantly contribute to highway and road expenditures. An attempt to explain highway and road expenditures used time-series and cross-sectional data, i.e., ten years by 53 counties. After correcting for serial correlation, four variables remained explaining only 15 percent of the variation in highway and road expenditures. Various data transformations and models were used in an attempt to improve the explanatory power of the individual variables, but these statistical transformations had little effect on the results. The most significant variables were density, mileage of state highway systems, mileage of all county and township roads and streets, and the ratio of land area divided by mileage of state highway systems.

Dummy variables were used to determine if some counties were significantly different with combination of highway expenditures and county population. Due to the relatively large per capita expenditures on highways and roads, Billings, McKenzie, Slope, Oliver, and Golden Valley counties were tested. Of the counties tested, only Golden Valley county was not significantly different. Cass, Grand Forks, Burleigh, and Ward were tested because of their high population, large highway expenditures, and low per capita expenditures. Although these counties appear to be different when examined using data plots, they were not significantly different.

Annual highway and road expenditures were examined. Instead of using ten years of data per analysis, each year was regressed on the same variables used in the original analysis. Regressing on individual years provided much better explanation of expenditures. By using only one year, differences across counties were examined, not differences across years and between counties. Although the variables remaining significant and the amount of variation explained varied each year, highway and road expenditures were a function of the mileage of roads within the county, the amount of travel on those roads, land area, and population. Using various combinations of the above variables, at least 70 percent of the variation per year in highway and road expenditures could be explained.

With the exception of estimates of annual motor vehicle miles of travel and population, all variables used in the analysis represent parameters, i.e., the value remained constant for all years. Lack of statistical fit can be partially blamed on using parameters and not having enough variables explaining highway and road expenditures across time.

Per capita highway expenditures were regressed upon the same variables used in the earlier analyses. The squared value of population, land area, and density were included in the analysis. However, when regressing per capita highway expenditures using time-series and cross-sectional data, very little explanation was found. Per capita expenditures were analyzed by year with approximately the same results, suggesting variables other than the ones used must exist explaining per capita highway and road expenditures.

Analysis indicates that across time the variables used explain very little of the highway and road spending. However, when used on individual years, their explanatory power increases, suggesting differences between counties can be explained using county parameters but differences between counties over time can not be effectively explained. Very little of the variation in per capita expenditures, either across time or across counties, could be explained statistically. The most significant variables were measures of mileage of county roads, travel on those roads, and population.

Health and Human Services

Health and human services represents expenditures for services or programs mandated by the state and/or federal government. The basic structure of county welfare and social service departments evolved around implementation of state programs. Thus, health and human service expenditures should reflect how many people in the county qualify and use these programs. Eligibility for benefits with most programs centers around disposable income, number of dependents, age, and other demographic variables. Thus, health and human service expenditures should reflect those demographics.

Regression analysis was used on both time-series and cross-sectional data. The variables used were land area, population, and density. In the final model, population and density explained 66 percent of the variation in county health and human service expenditures. When using only cross-sectional data, population explained 75 to 90 percent of the variation in health and human service expenditures. Because population explained much of the variation in health and human service expenditures, acquiring estimates of specific demographic variables was not pursued.

Per capita expenditures were also examined using both time-series and cross-sectional and cross-sectional data only. Although population was very helpful in explaining much of the variation in health and human service expenditures, it explained only 10 to 25 percent of the variation in per capita health and human service expenditures when using cross-sectional data only. Various data transformations were used in an attempt to fit curve-linear models. One model was able to explain 30 percent of the variation in per capita expenditures for health and human services. The most significant variables were density, land area, and population.

Cass, Grand Forks, Burleigh, and Ward counties' health and human service expenditures were tested and found to be statistically different than the other counties. This may indicate that as population increases people demand more and better services, not implying that there may be a disproportionate percent of the population using state aid programs, but instead high

population counties may provide services in addition to those required by the state government.

General Government

Expenditures for general government represent expenses for county offices not directly associated with any other spending category, courthouse maintenance, county insurance premiums, advertising, printing, record keeping, interest on operation debt, office supplies and others (see Table 1). General government expenditures may vary by county according to factors influencing expenses, such as building or maintaining a courthouse, office and other personnel salaries, elaborate or extensive record keeping, level of insurance coverage, and amount of state and federal aid not designated to a specific expense. Since general government expenditures are comprised of a wide array of expenses, the number of specific variables that can be quantified and used to analyze this category are very limited.

Regression analysis was used to determine if county population, land area, and density could explain the variation in general government expenses. Population explained 45 percent of the variation in general government expenditures when regressed on time-series and cross-sectional data. Another model, using population and land area squared explained 46 percent of general government expenditures. When only cross-sectional data were used, population explained between 54 to 81 percent of the variation in general government expenditures. In the three years, 1977-1979, density explained slightly more variation than population.

Per capita expenditures for general government were analyzed using time-series and cross-sectional, and cross-sectional data only. Various combinations of land area, population, and density explained only 15 percent of the variation in per capita general government expenditures when time-series and cross-sectional data were used. When only cross-sectional data were used, the same combination of variables explained between 4 to 40 percent (varied by year) of the variation in per capita general government expenditures.

Cass, Grand Forks, Burleigh, and Ward counties were significantly different than other counties when dummy variables were used to test levels of spending. Having relatively large populations, compared to other North Dakota counties, may cause certain general government expenses to be higher and/or they may incur expenses not commonly encountered by other counties.

Law Enforcement

Sheriff and court expenses, including states attorney, represent most law enforcement expenditures by counties. Since law enforcement expenses center around sheriff and court costs, the factors influencing these departments should also explain much of a county's law enforcement expense. Sheriff expenses should be influenced most by the number, frequency and area of patrols; number and salary levels for deputies; number of minor and serious crimes requiring investigation; and sheriff station expense.

The most common court costs are county, district, and juvenile courts. Court costs should be related to the number of trials, judge expenses, and jury expenses. Other items affecting law enforcement expenditures include care and transport of prisoners and jail expense. Thus, even though there are only a few major components of law enforcement expenditures, the factors influencing these costs are numerous. However, many of the mentioned factors are a function of population. As population increases, crimes can be expected to increase, pushing up sheriff and court costs.

Regression analysis was used to determine how population, land area, and density affect law enforcement expenditures. When using both cross-sectional and time-series data, the combination explaining the most variation (63 percent) in law enforcement expenditures was population and density. When only cross-sectional data were used, population explained 69 to 92 percent of the variation in law enforcement expenditures.

Per capita law enforcement expenditures were examined using both cross-sectional and times-series data. Various combinations of population, land area, and density could only explain about 3 to 8 percent of the variation in per capita law enforcement expenditures. Although population, and to some extent density, were useful in explaining spending levels, they had little value in explaining per capita expenditures.

V. SUMMARY

Individual county expenditure data were gathered for ten years, 1977–1986. County expenditure data were divided into eight categories; general government, law enforcement, education, emergency, health and human services, environment, highways and roads, and miscellaneous spending. All budgets were adjusted to reflect calendar year equivalents. Spending trends and levels were determined using the county expenditure data and other county variables,

County spending increased about 19 percent over the ten-year period, 1977–1986. Per capita county spending in North Dakota increased about 13 percent from 1977 to 1986. Highways and roads, general government, health and human services, and law enforcement account for almost 92 percent of all county expenditures. The largest change in spending by category occurred with education, decreasing 65 percent; however, education is primarily a school district function in North Dakota. Environment increased more than any other category, increasing 471.6 percent, yet still representing only a small portion of spending.

County revenue sources include intergovernmental transfers; taxes; charges for services; fines and forfeits; licenses, permits, and fees; and miscellaneous. Counties received almost 83 percent of their revenue from intergovernmental transfers and taxes in 1985 and 1986. North Dakota counties reliance on intergovernmental revenue and taxes was similar to counties in neighboring states.

Regression analysis was used to determine the influence of population, land area, population density, and other variables on county spending. Population, population density, and land area were usually significant influences on spending, but varied by category in their explanatory power; 17, 66, 45, and 63 percent of the variation for highways and roads, health and human services, general government, and law enforcement, respectively, when regressed on only cross-sectional data. Explanatory power was somewhat less when the same variables were used on time-series and cross-sectional data.

Strategies to cope with fiscal stress include increasing revenue, reducing expenditures, and program and administration innovation. Revenue could be increased by imposing user fees, capitalizing on new grants, raising taxes, imposing new taxes, and annexing additional land. Expenditures could be reduced by using alternative service delivery approaches, taking advantage of economies of scale, regulatory and tax incentives, cutback management strategies, and eliminating services. Program and administration innovation includes such measures as new methods of fiscal management, personnel management, capital improvement programs, budgeting systems, adopting new technologies, and computerized management information systems.

VI. CONCLUSIONS

Most North Dakota counties seem to be efficient providers of public services. The range in delivery costs can be traced to varying conditions, demographic as well as geographic. There is no single factor except for availability of revenue and population that appears to be most related to spending levels across all North Dakota counties. Many factors exist that influence and possibly determine various spending levels among counties. However, due to spending variablities across counties, no rigorous statistical conclusions could be drawn about what influences spending.

North Dakota counties are fiscally dependent upon intergovernmental revenue and property taxes. Thus, counties are indirectly dependent on the economic health of major industries within North Dakota for consistent sources of revenue.

The existence of economies of scale is unclear in most spending categories; however, some potential for savings by taking advantage of economies of scale may exist for general government and highways and roads.

VII. RECOMMENDATIONS

County expenditures and revenues should continue to be maintained, with more attention given to factors influencing spending. The county expenditure data set (Bangsund and Leitch 1990) should be maintained and upgraded annually. High cost counties could evaluate their service delivery costs to determine if there are any potentials for lowering costs. Also, more intensive evaluation of service delivery methods used in North Dakota may help counties improve their delivery of public services.

The possible examination of other government units' delivery of public services, in conjunction with county governments, would provide insight into areas were local governments could cooperate to provide a cost effective spectrum of public services in North Dakota.

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Appendix A
Letters to County Auditors

AGRICULTURAL ECONOMICS
MORRILL HALL
P.O. BOX 5636

TELEPHONE 701-237-7441

March 3, 1988

Ms. Betty Svihovec
County Auditor's Office
Adams County Courthouse
Hettinger, ND 58639

Dear Ms. Svihovec:

The Department of Agricultural Economics at North Dakota State University, in conjunction with the Agricultural Experiment Station and the North Dakota Extension Sevice is conducting a series of studies on state and local government finance in North Dakota. We are currently working on one study that examines equity issues of state-level taxes and a second study that will investigate local government service delivery costs. (A summary of each study is attached for your information.)

Several groups and associations have agreed to assist in these studies in any way they can. Among these are the ND Association of Counties, League of Cities, several commodity ag groups, and others. The University has, however, committed to carrying out these initial two studies without any financial support from outside interests, primarily to maintain objectivity.

While secondary data are available in a variety of forms, we are attempting to construct a data set that will be useful to us for continued meaningful work on state and local tax issues. Therefore, we are building our own data set from primary sources. We are attempting to create a data set starting from January 1976 and progressing to the most recent year available.

We visited with Mark Johnson, Executive Director of the North Dakota Association of Counties, and he suggested that county auditors might be able to provide valuable data for our study. We would appreciate it very much if you would send us the following:
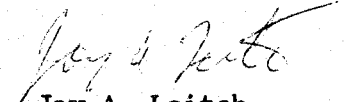
- Photocopies of <u>county financial reports</u> or sometimes called <u>financial audits</u> for your county from January 1976 through the most recent year available. We need the lowest level of disaggregation--the most detail--that is available. (We are not interested in appropriated or budgeted amounts, just actual expenditures for both general and special revenue funds.)

We can compensate you for reasonable photocopy expenses. Please just send an invoice for photocopying along with the copies. If you believe it will cost you over $40, please call me before you start.

In order for our studies to be useful for the next Legislative session, we would appreciate your budgets by the middle of March. We realize this may take some time on your part, but we believe it will be worth your time in the long run. All results, findings, and conclusions from these studies will be made available to you, as well as the detailed data set we construct for your county.

If you have any questions, please call Dr. Jay A. Leitch (237-7467), the project manager; Dr. Norb Dorow (237-7384), extension agricultural economist; or Mr. Mark Johnson (258-4481), Executive Director, ND Association of Counties. Thank you for your cooperation and assistance in these important studies of state and local taxes in North Dakota.

Sincerely,

Jay A. Leitch
Associate Professor

JAL:lr

Enclosure

Appendix B
Source of Data by County and Type

APPENDIX TABLE B1.   TYPE OF SOURCE FROM WHICH EXPENDITURE DATA WAS
  EXTRACTED BY COUNTY, NORTH DAKOTA, 1977-1986.

County	1986	1985	1984	1983	1982	1981	1980	1979	1978	1977
ADAMS	SA	————	————	————	————	————	————	————	SA*	SA*
BARNES	SA	B	SA	————	————	————	————	————	————	SA
BENSON	SA	SA	SA	SA	SA	SA	CB	CB	CB	CB
BILLINGS	CB	————	————	————	————	————	————	————	————	CB
BOTTINEAU	CB	CB	SA	SA	SA	SA	O	O	O	O
BOWMAN	CW/CB	————	————	————	————	————	————	————	————	CW/CB
BURKE	SA	SA	CW/SA	CW/SA	SA	SA	SA	SA	SA/CB	SA/CB
BURLEIGH	CP	————	————	————	————	————	————	————	————	CP
CASS	CB	————	————	————	————	————	————	————	————	CB
CAVALIER	SA	SA	SA	SA	SA	SA	CW	CW	CW	CW
DICKEY	SA	SA	CB	CB	SA	SA	CB	CB	CB	CB
DIVIDE	SA	SA	SA	SA	SA	SA	CB	CB	CB	CB
DUNN	CW	CW	CB	————	————	————	————	————	————	CB
EDDY	SA	SA	SA	SA	SA	SA	NA	NA	NA	NA
EMMONS	SA	————	————	————	————	————	————	————	————	SA
FOSTER	CB	CB	CB	CB	SA	SA	SA	SA	SA	SA
G VALLEY	B	B	B	SA	SA	SA	SA	SA	SA	SA
G FORKS	SA	————	————	————	————	————	————	————	————	SA
GRANT	SA	————	————	————	————	————	————	SA	NA	NA
GRIGGS	SA	SA	CB	CB	CB	SA	CB	CB	CB	CB
HETTINGER	CW	SA	SA	SA	SA	CB	CB	CB	CB	CB
KIDDER	SA	SA	SA	SA	SA	SA	SA*	SA*	SA*	SA*
LAMOURE	SA	SA	SA/CP	SA/CP	SA	SA	SA	SA	SA	SA
LOGAN	SA	SA	SA	SA	SA	SA	CB	CB	CB	CB
MCHENRY	SA	SA	SA	SA	SA	CB	CB	CB	CB	CB
MCINTOSH	SA	————	————	————	————	————	————	————	————	SA
MCKENZIE	CB	————	————	————	————	————	————	————	————	CB
MCLEAN	SA	SA	SA	SA	SA*	SA*	SA*	SA*	SA*	SA*
MERCER	SA	SA	SA	SA	SA	SA	SA	SA	CB	CB
MORTON	CP	CP	CP	CP	SA	SA	SA	SA	SA	SA
MOUNTRAIL	SA	SA	B	B	B	B	B	SA	SA	SA
NELSON	CB	CB	CB	SA	SA	SA	SA	SA	SA	SA
OLIVER	SA	————	————	————	————	————	————	————	————	SA
PEMBINA	SA	SA	SA	SA	CW	CW	CW	CW	CW	CW
PIERCE	SA	SA	B	B	B	SA	SA	SA	SA	SA
RAMSEY	SA	————	————	————	————	————	————	————	————	SA
RANSOM	SA	SA	SA	SA	SA	SA	B	B	B	B
RENVILLE	SA	SA	SA	SA	SA	SA	CB	CB	CB	CB
RICHLAND	SA	SA/CW	SA	SA	O	O	O	O	O	O
ROLETTE	CB	————	————	————	————	————	————	————	————	CB
SARGENT	CW	CW	CB	CB	SA	SA	CB	CB	CB	CB
SHERIDAN	CW	CW	CB	————	————	————	————	————	————	CB
SIOUX	CB	————	————	————	————	————	————	————	CB	NA
SLOPE	CB	————	————	————	————	————	————	————	————	CB
STARK	CW/SA	CW/SA	SA	————	————	————	————	————	————	SA
STEELE	CW	CW	CB/CW	CB	CB	CB	CB	CB	CB	CB
STUTSMAN	CP/SA	CP/SA	CP/SA	CB	CB	CB	CB	CB	CB	CB
TOWNER	CW/SA	CW/SA	SA	————	————	————	————	————	————	SA
TRAILL	CW/CB	————	————	————	————	————	————	————	————	CW/CB
WALSH	CB	————	————	————	————	————	————	————	————	CB
WARD	CP	————	————	————	————	————	————	————	————	CP
WELLS	CB	————	————	————	————	————	————	————	————	CB
WILLIAMS	CW/SA	CW/SA	SA	————	————	————	————	————	————	SA

Where   SA = State Audit
        CW = County Worksheet or Statement of Expenses
        CB = County Budget
        CP = Computer Printout of Budget or Expenses
        NA = Adequate Financial Information Not Available
        O = Other Source of Financial Information
        B = Combination of SA, CW, and CB
        * = Insufficient Detail For Analysis

Appendix C
Total North Dakota County Spending by Year for All Categories
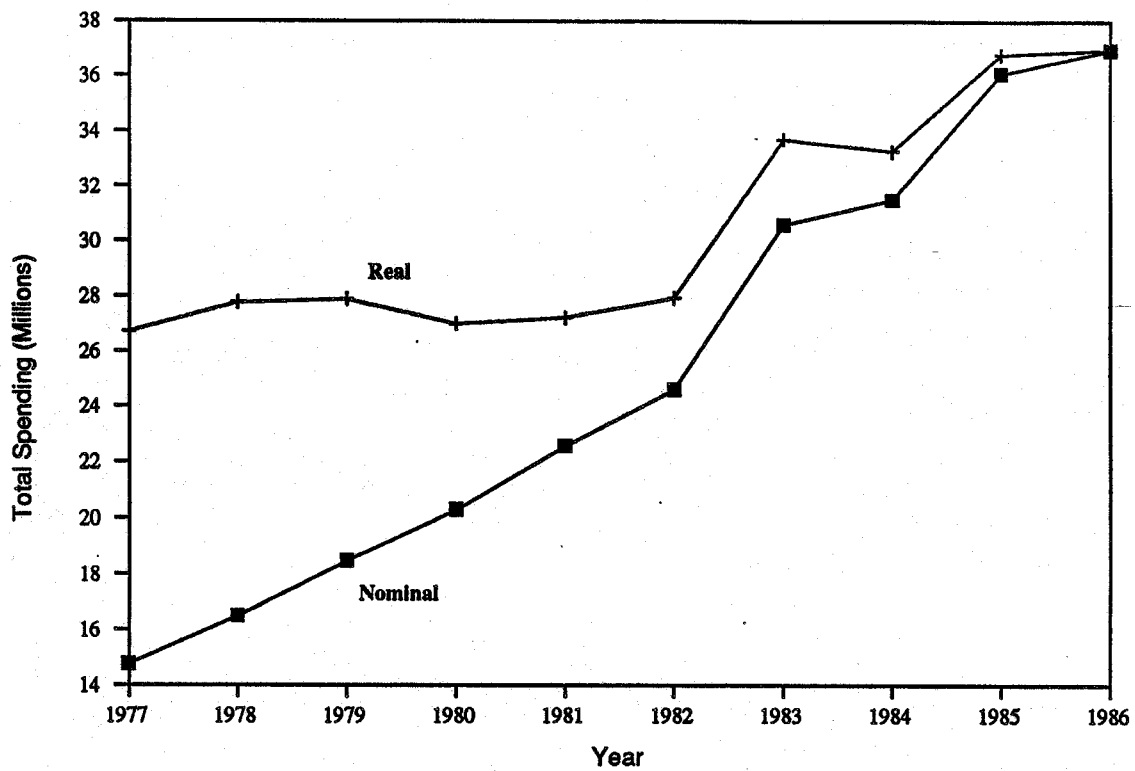
Appendix Figure C1. Nominal and Real County Spending, General Government, North Dakota, 1977-1986
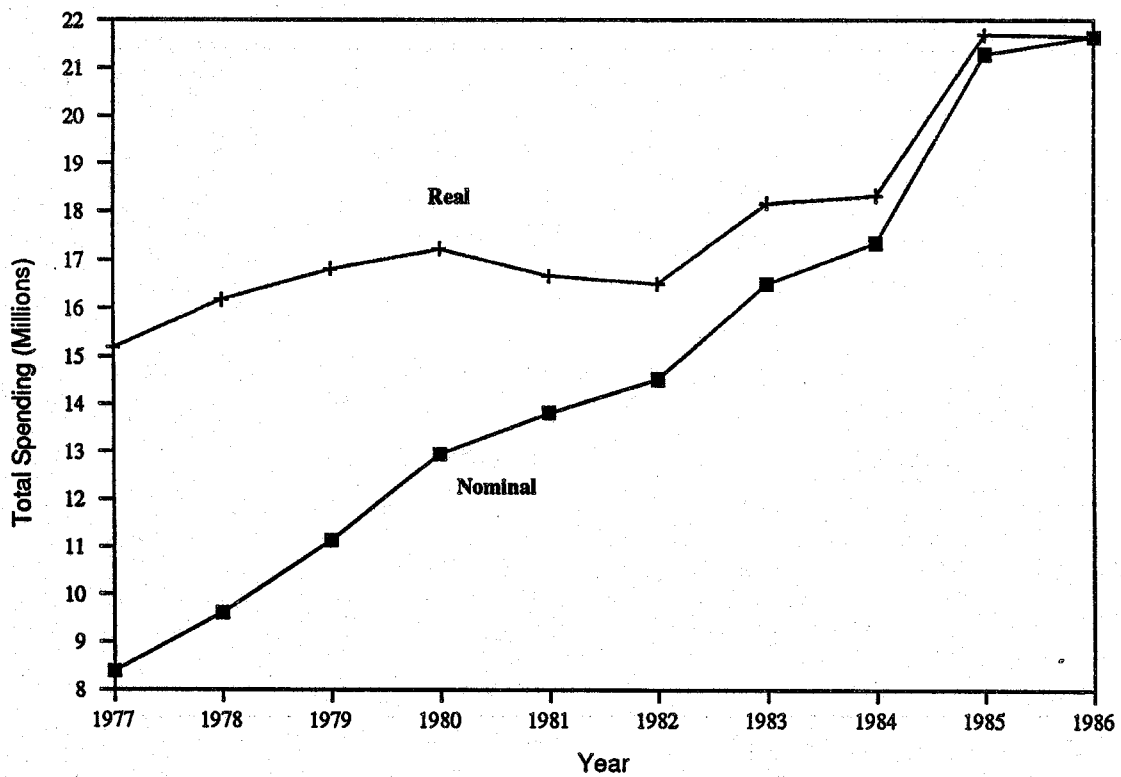
Appendix Figure C2. Nominal and Real County Spending, Law Enforcement, North Dakota, 1977-1986
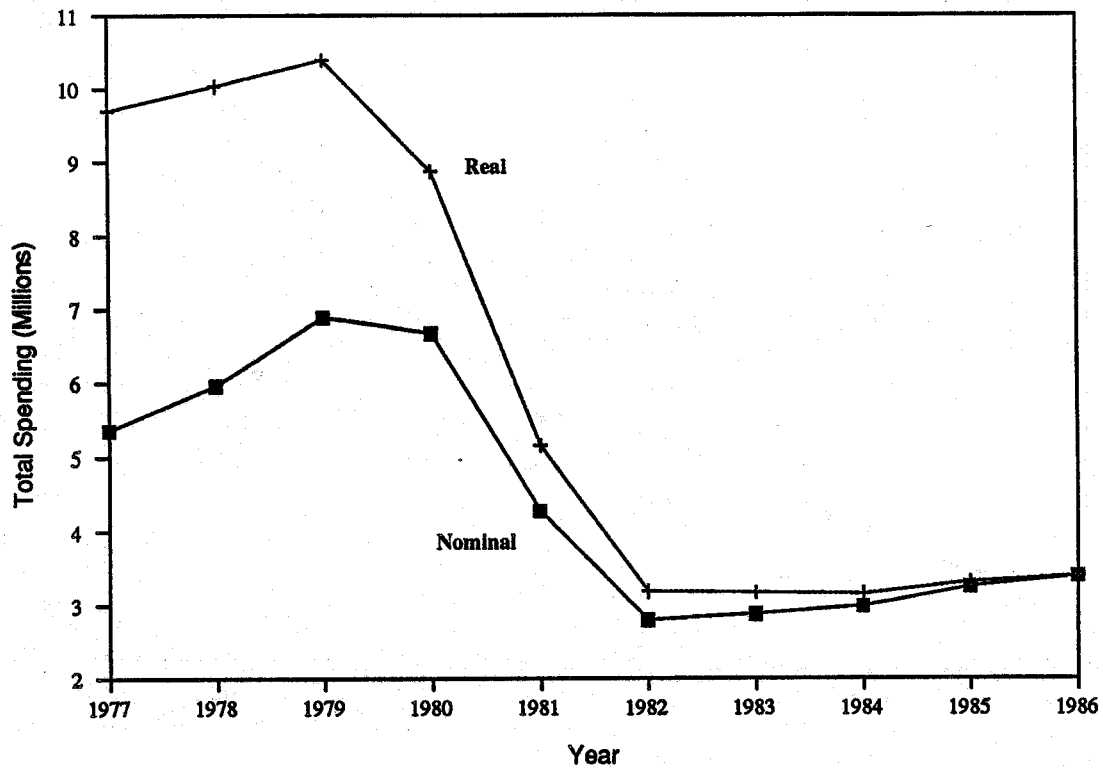
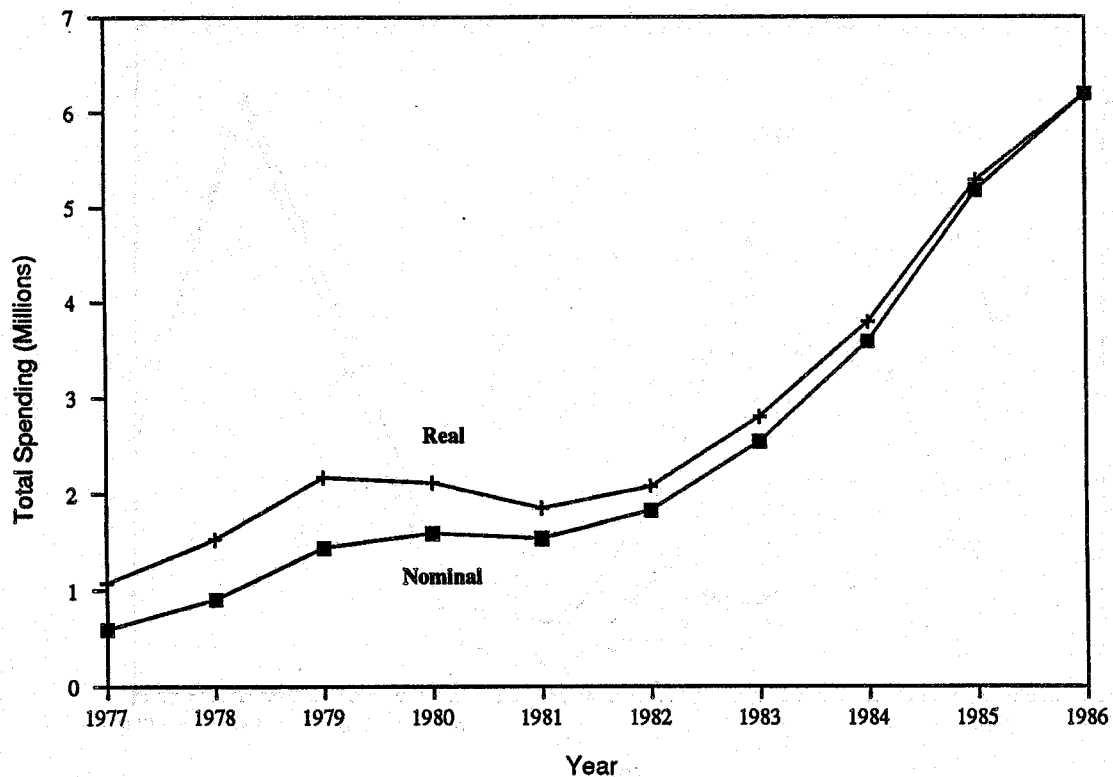Appendix Figure C3.   Nominal and Real County Spending, Education, North
Dakota, 1977-1986
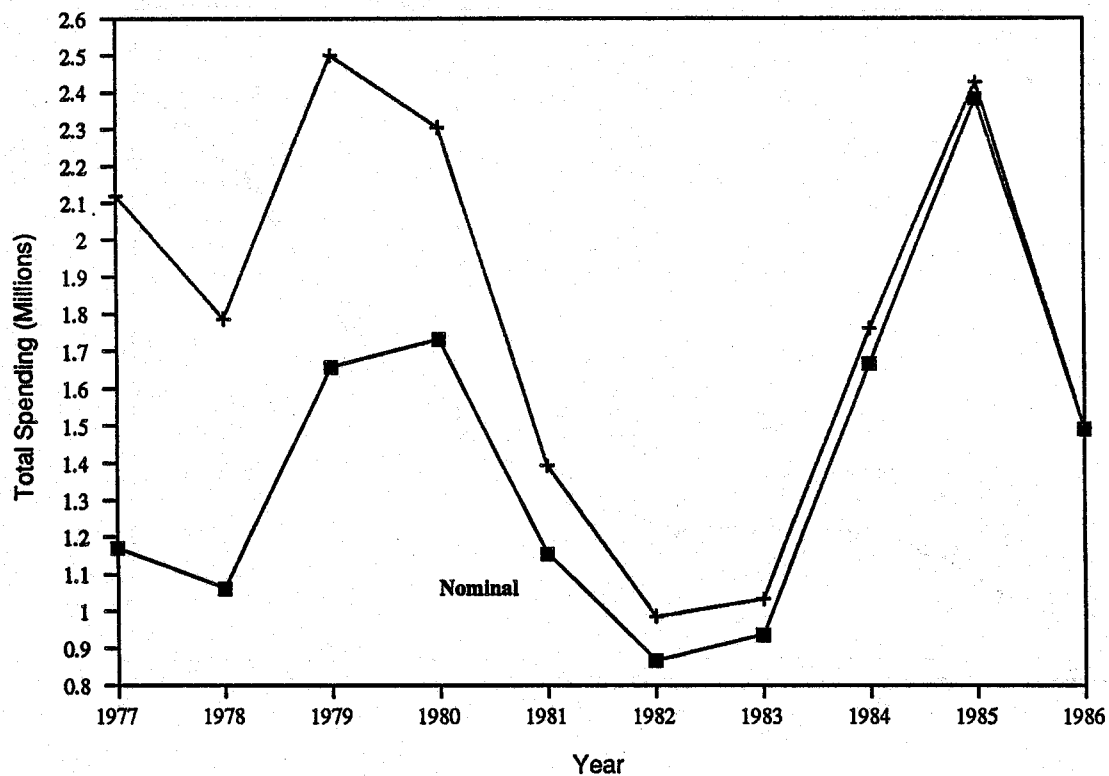
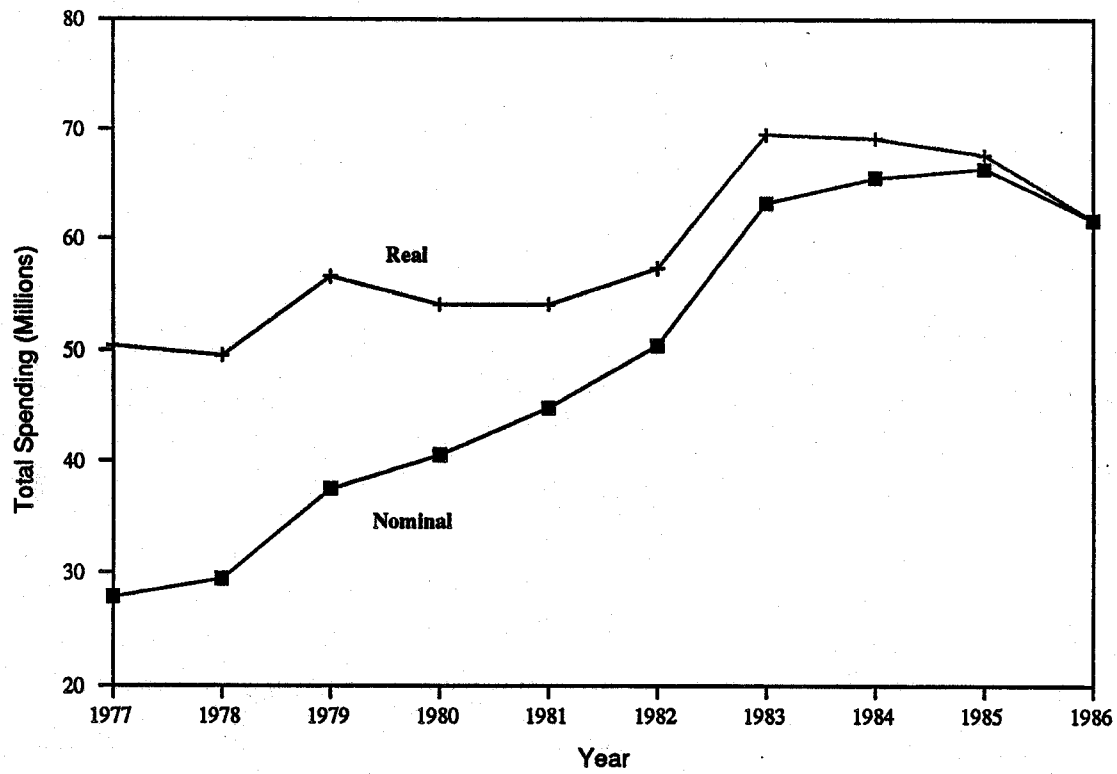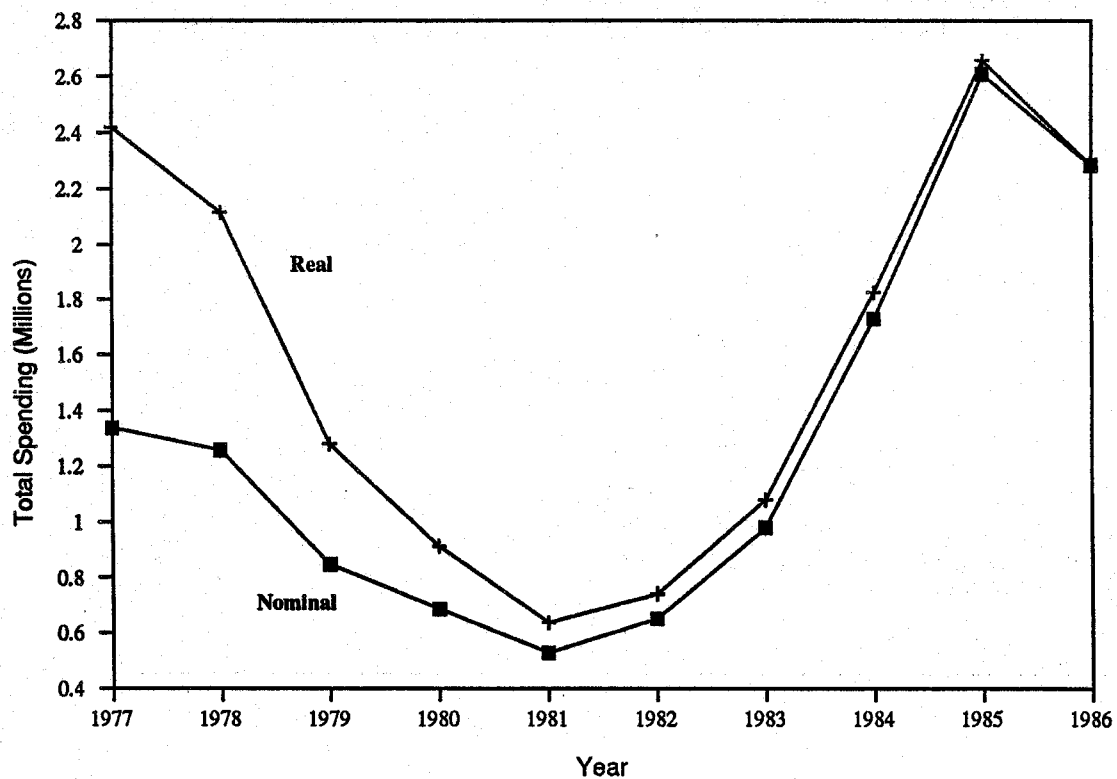Appendix Figure C4.   Nominal and Real County Spending, Emergency, North
Dakota, 1977-1986
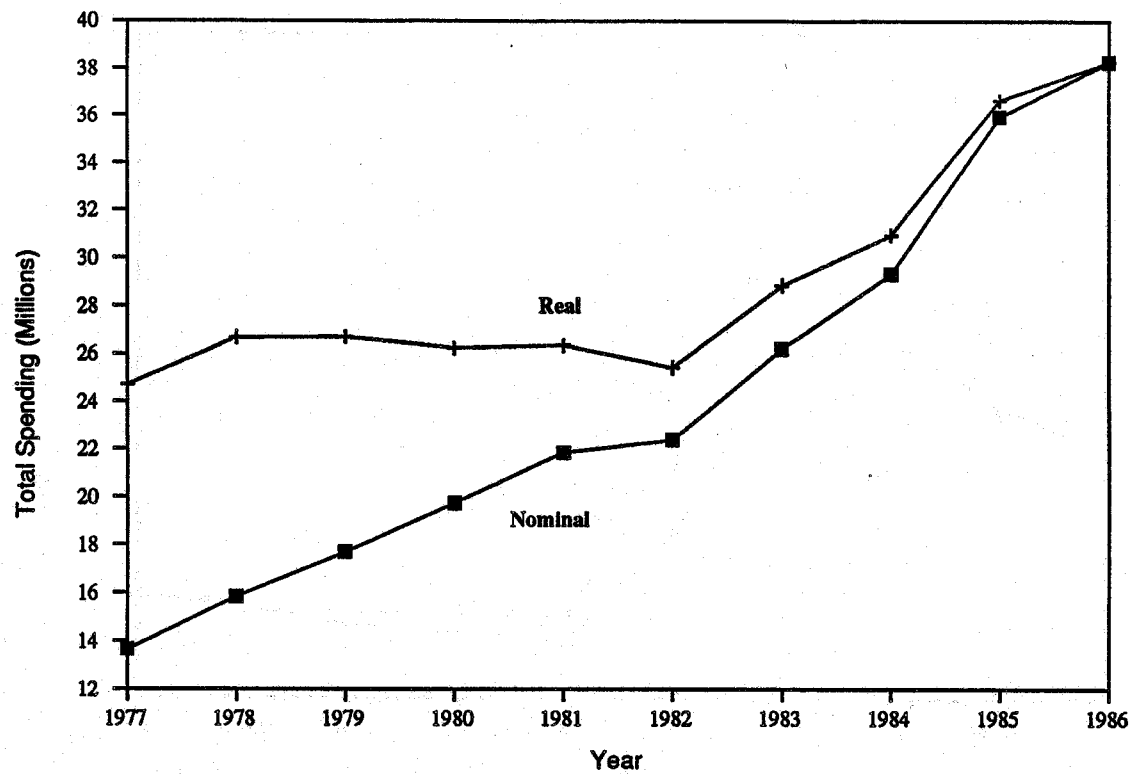
Appendix Figure C5. Nominal and Real County Spending, Health and Human Services, North Dakota, 1977-1986

Appendix Figure C6. Nominal and Real County Spending, Environment, North Dakota, 1977-1986

Appendix Figure C7. Nominal and Real County Spending, Highways and Roads, North Dakota, 1977-1986

Appendix Figure C8. Nominal and Real County Spending, Miscellaneous, North Dakota, 1977-1986

Appendix D
North Dakota Counties' Per Capita Spending for Education,
Emergency, Environment, and Miscellaneous Categories
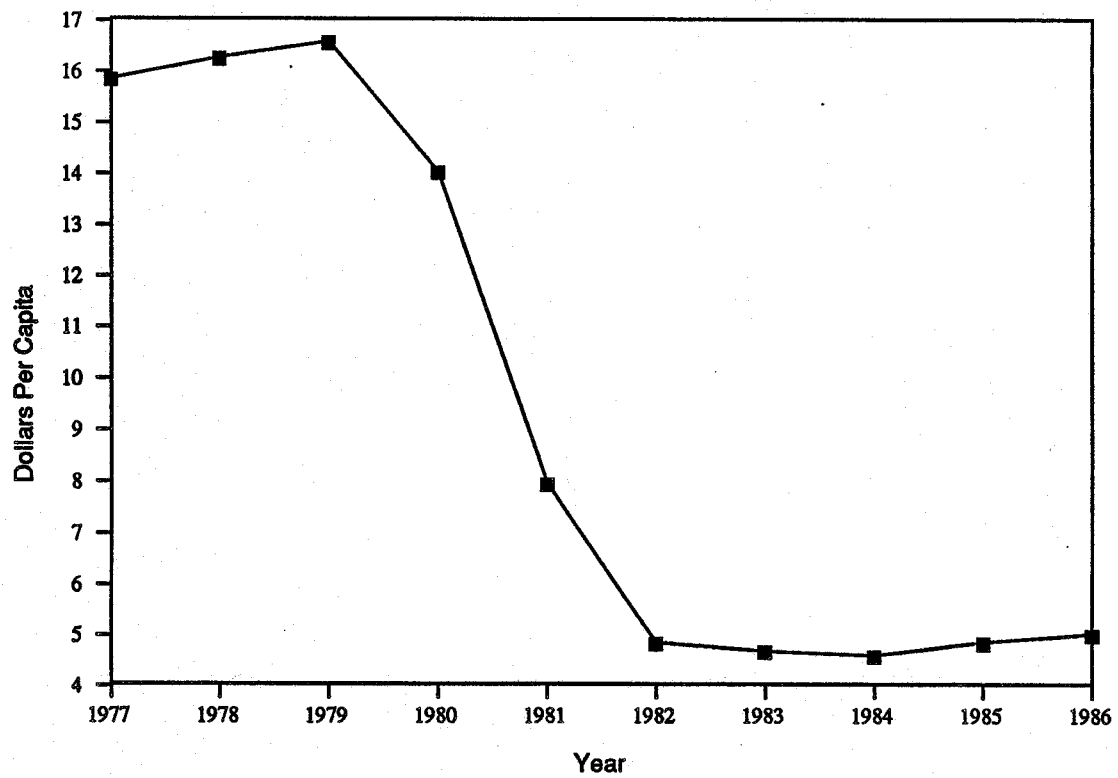
Appendix Figure D1. Real Per Capita County Expenditures for Education, North
Dakota, 1977-1986
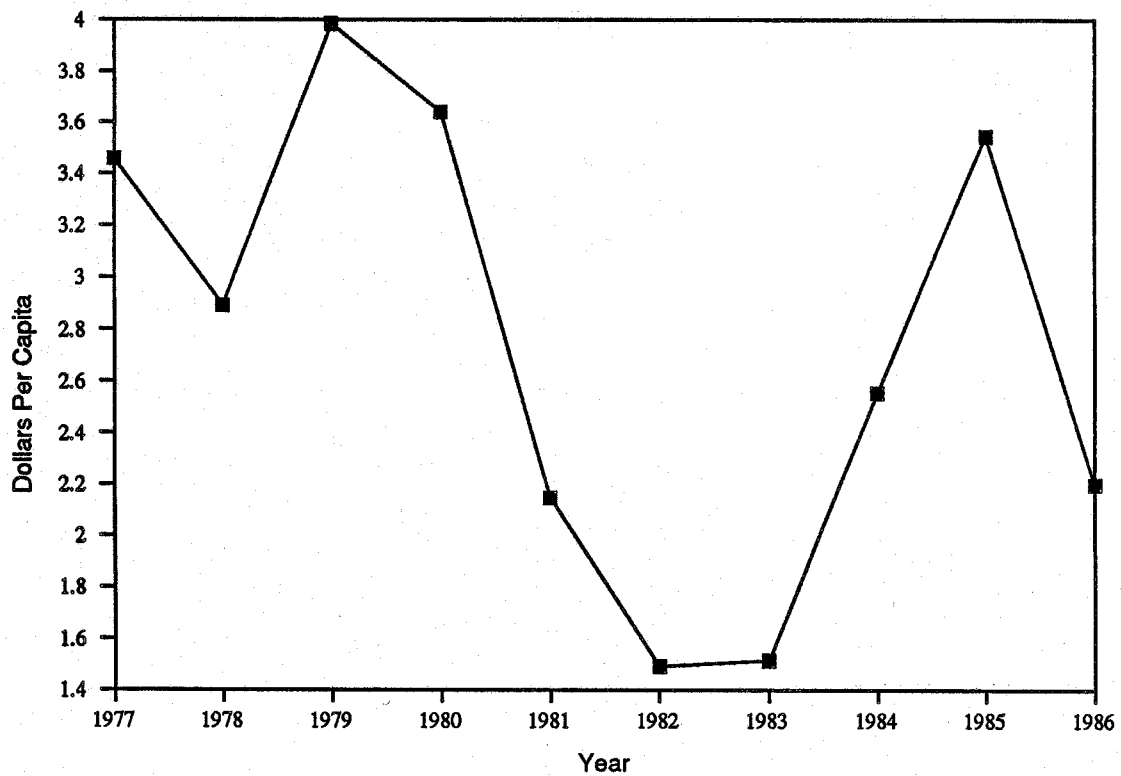
Appendix Figure D2. Real Per Capita County Expenditures for Emergency, North
Dakota, 1977-1986
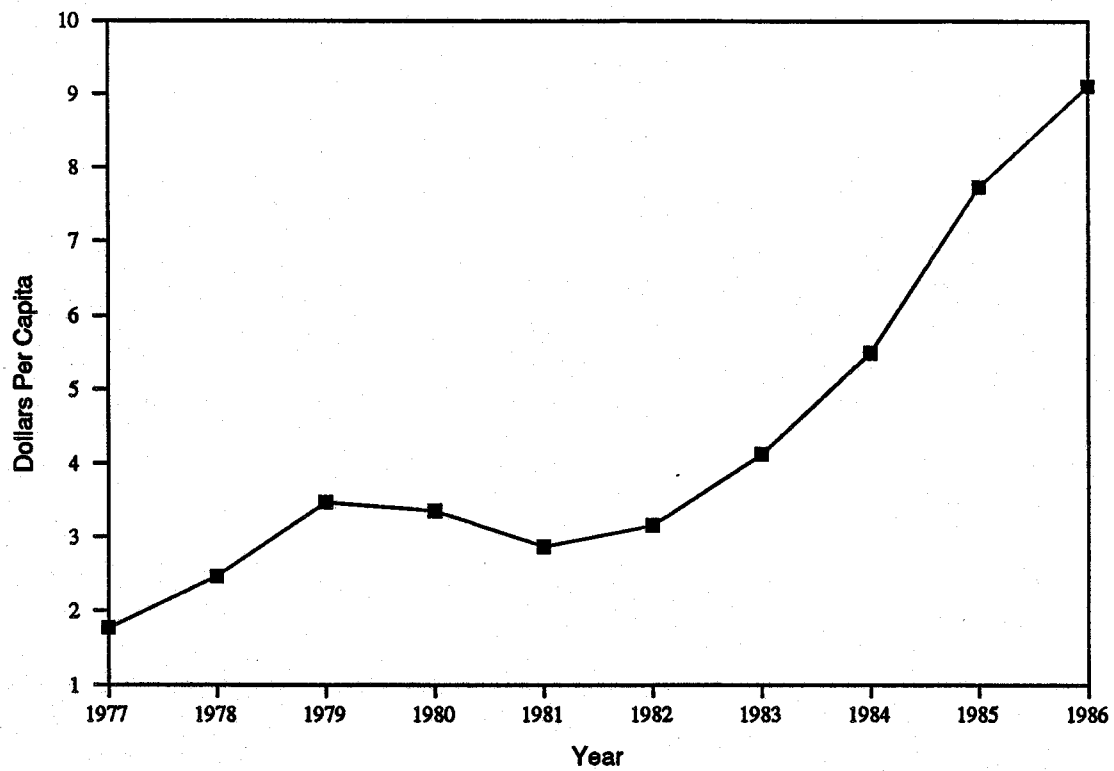
Appendix Figure D3. Real Per Capita County Expenditures for Environment, North Dakota, 1977-1986
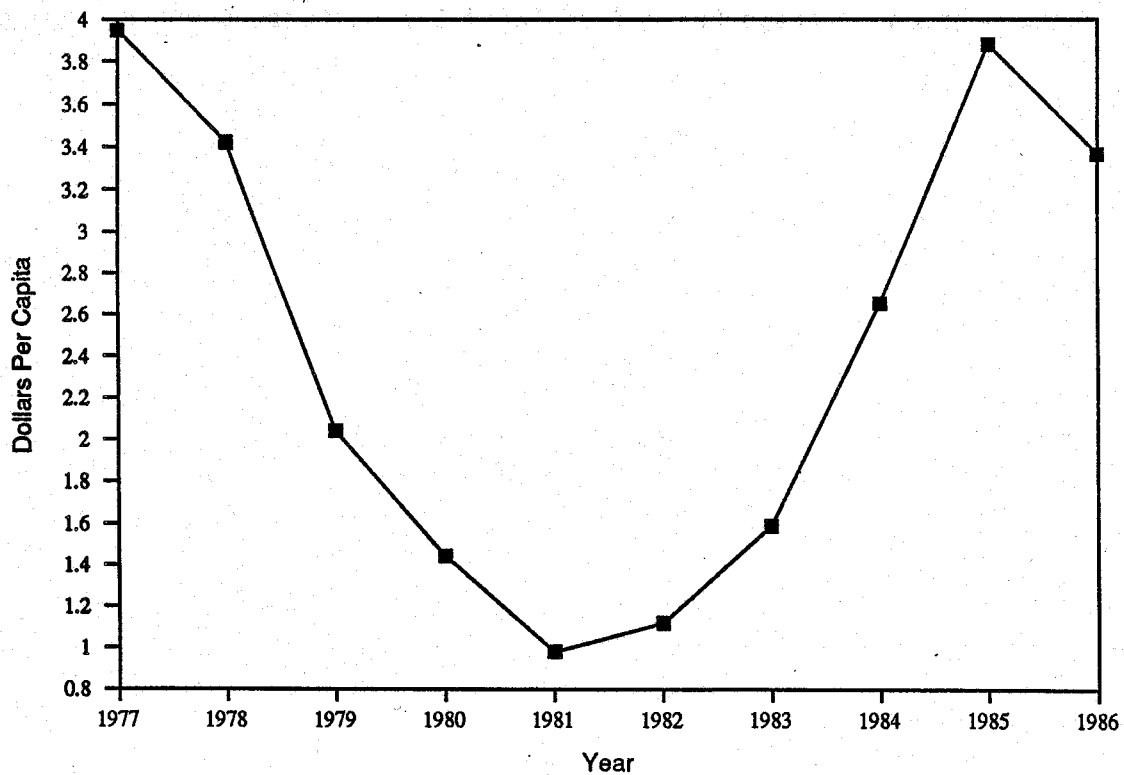
Appendix Figure D4. Real Per Capita County Expenditures for Miscellaneous, North Dakota, 1977-1986

Appendix E
North Dakota Counties' Average Percent of Total Expenditures Spent by Category

APPENDIX TABLE E1.   AVERAGE PERCENT OF TOTAL BUDGETS SPENT IN SPENDING CATEGORIES BY NORTH DAKOTA COUNTIES 1977-1986

COUNTY	General Government	Law Enforcement	Education	Emergency	Health & Human Services	Environment	Highways & Roads	Miscellaneous
	(-- Percent --)							
ADAMS	23.42	15.74	3.35	2.68	13.73	1.21	37.45	2.41
BARNES	23.02	10.85	2.67	1.12	19.31	1.26	41.27	0.50
BENSON	17.21	7.44	3.52	0.44	32.00	2.32	36.54	0.54
BILLINGS	11.77	4.60	0.93	0.45	3.28	0.40	78.56	0.01
BOTTINEAU	23.50	7.89	2.77	1.30	15.50	1.31	46.72	1.00
BOWMAN	28.00	5.66	3.19	0.81	11.03	2.30	49.00	0.01
BURKE	23.50	9.59	3.01	0.59	15.66	1.36	45.63	0.67
BURLEIGH	19.15	15.02	1.55	1.89	29.40	1.31	30.63	1.04
CASS	17.15	18.64	12.20	1.88	26.71	1.55	20.86	1.01
CAVALIER	20.98	9.73	2.77	1.47	20.05	3.09	40.98	0.93
DICKEY	20.33	9.31	2.63	0.71	18.54	1.35	46.73	0.40
DIVIDE	20.04	7.64	4.28	1.51	13.99	0.89	49.55	2.11
DUNN	19.44	6.92	3.39	1.55	15.34	4.92	46.97	1.48
EDDY	23.67	11.82	4.02	1.43	19.96	2.13	33.63	3.33
EMMONS	17.77	9.41	3.13	0.66	16.10	2.24	50.25	0.44
FOSTER	24.94	8.73	2.87	1.06	18.77	2.59	39.73	1.33
GOLDEN VALLE	25.86	12.40	2.88	1.73	8.64	2.06	44.75	1.69
GRAND FORKS	25.29	16.67	2.18	1.99	25.17	2.02	26.08	0.60
GRANT	22.93	6.53	2.36	0.62	16.64	4.38	46.42	0.11
GRIGGS	25.35	8.42	6.07	0.90	14.83	2.21	41.27	0.95
HETTINGER	28.85	8.82	3.10	0.52	17.11	2.24	39.28	0.08
KIDDER	21.08	8.42	2.79	0.35	20.88	1.07	44.10	1.31
LA MOURE	23.50	8.06	2.51	1.05	12.72	2.00	48.04	2.12
LOGAN	28.27	10.06	3.71	0.76	17.23	1.46	37.58	0.93
MCHENRY	23.35	7.79	5.34	1.92	19.51	2.49	36.09	3.51
MCINTOSH	22.75	7.42	3.18	0.50	17.30	1.24	47.52	0.10
MCKENZIE	12.77	5.55	1.09	0.17	5.25	1.32	73.05	0.79
MCLEAN	17.08	13.04	1.31	0.19	13.34	1.71	52.88	0.46
MERCER	15.45	15.59	1.97	0.45	14.43	0.91	51.05	0.15
MORTON	17.46	18.73	1.77	1.11	20.31	2.17	37.79	0.66
MOUNTRAIL	25.88	13.75	2.52	0.25	14.58	1.71	40.18	1.14
NELSON	26.09	9.64	3.00	0.28	15.22	1.15	42.85	1.77
OLIVER	20.76	6.81	2.18	0.35	8.21	1.73	59.91	0.05
PEMBINA	17.98	10.30	6.96	0.88	24.50	3.65	34.53	1.19
PIERCE	24.34	11.18	5.98	0.89	24.31	0.79	32.30	0.20
RAMSEY	23.82	12.14	1.69	0.70	26.11	2.32	32.80	0.42
RANSOM	25.55	10.72	3.10	0.58	25.44	2.04	29.87	2.70
RENVILLE	19.62	7.03	4.09	0.24	11.36	2.10	53.72	1.83
RICHLAND	23.56	11.87	6.69	1.38	18.04	3.36	34.23	0.87
ROLETTE	24.88	12.93	2.72	1.26	23.26	1.44	33.32	0.18
SARGENT	29.60	8.09	5.44	1.61	19.10	1.47	33.94	0.74
SHERIDAN	17.01	8.33	5.32	0.14	19.50	1.25	48.22	0.23
SIOUX	25.29	10.16	5.50	0.50	32.77	0.33	25.15	0.29
SLOPE	17.31	5.69	7.06	0.68	9.61	2.16	57.31	0.18
STARK	21.56	15.65	2.10	1.51	19.05	3.53	36.40	0.19
STEELE	23.27	4.92	5.03	12.13	17.11	1.68	34.93	0.94
STUTSMAN	15.97	11.16	2.85	1.00	27.85	1.27	33.90	6.00
TOWNER	23.55	7.87	2.43	1.27	12.85	4.55	46.81	0.67
TRAIL	21.26	9.11	2.70	0.81	17.79	1.61	46.70	0.01
WALSH	23.42	10.52	6.17	1.11	19.15	4.13	34.19	1.32
WARD	18.12	14.04	7.23	0.69	24.31	1.91	32.11	1.59
WELLS	21.36	7.25	3.38	1.30	21.22	0.00	43.50	2.01
WILLIAMS	22.13	18.83	1.87	0.72	18.47	1.23	36.55	0.18
Average	21.78	10.32	3.65	1.17	18.21	1.95	41.87	1.05

Appendix F
Relationship Between Population and Average North Dakota County
Per Capita Expenditures for General Government, Law Enforcement,
Health and Human Services, and Highways and Roads
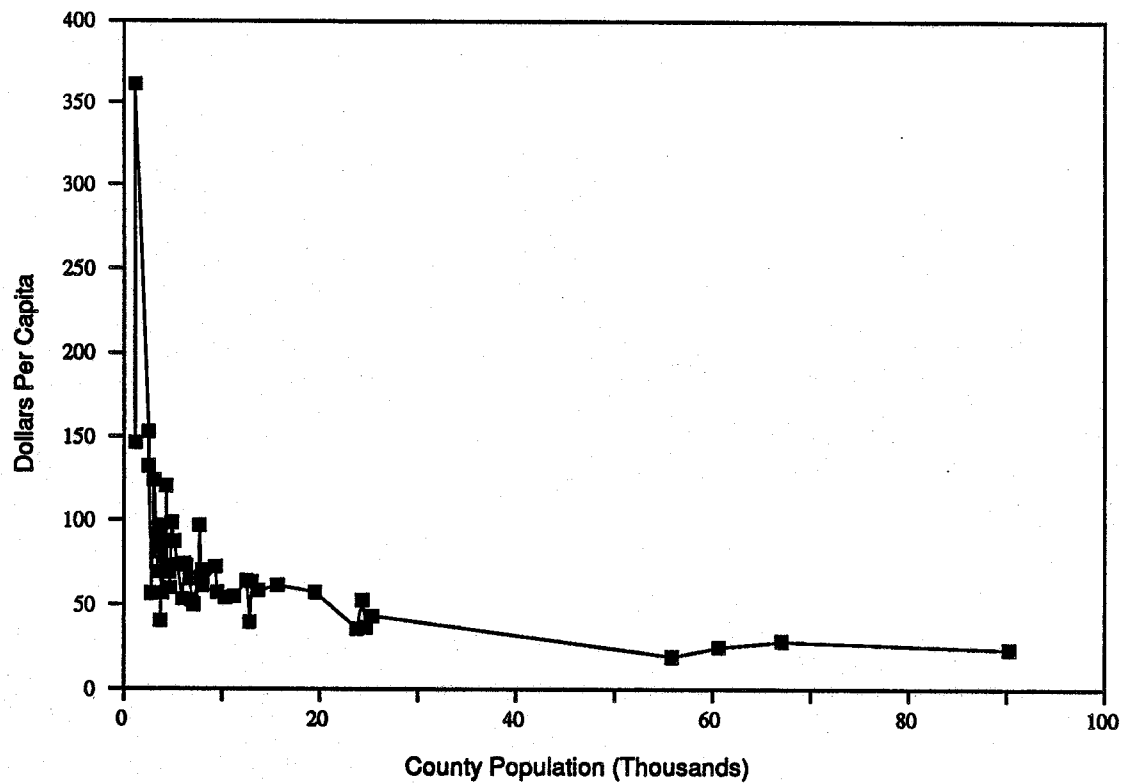
Appendix Figure F1. Average Per Capita County Expenditures for General
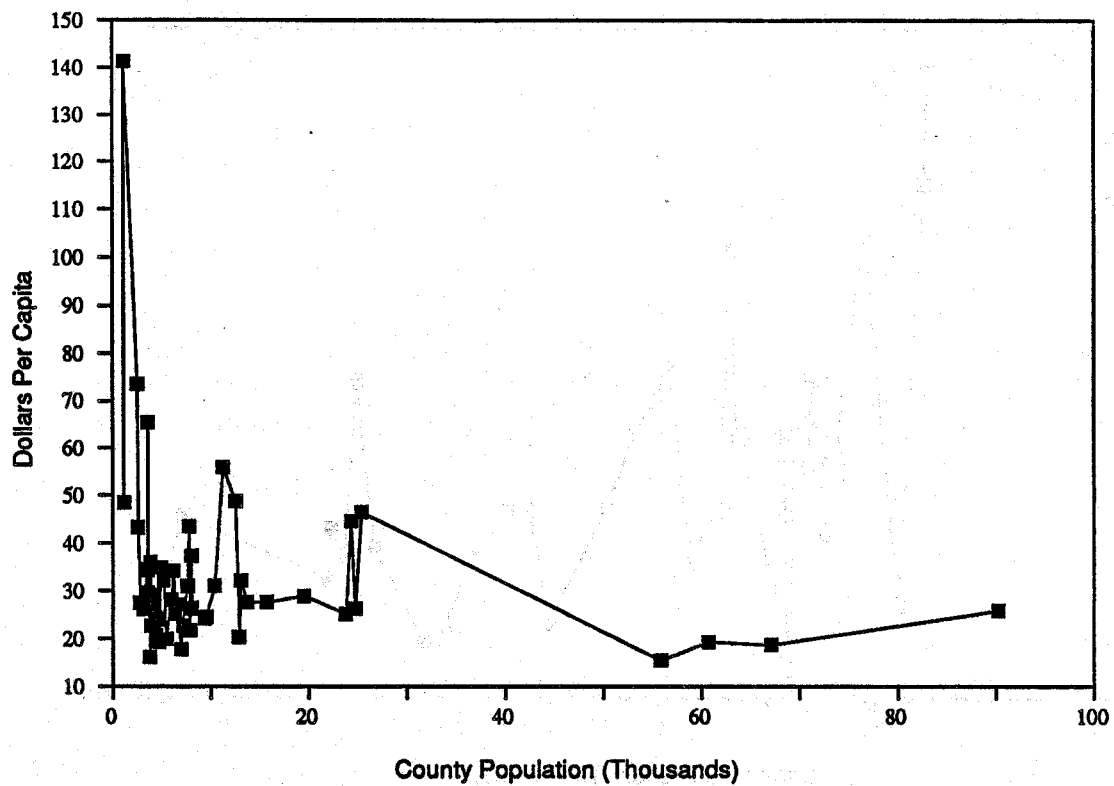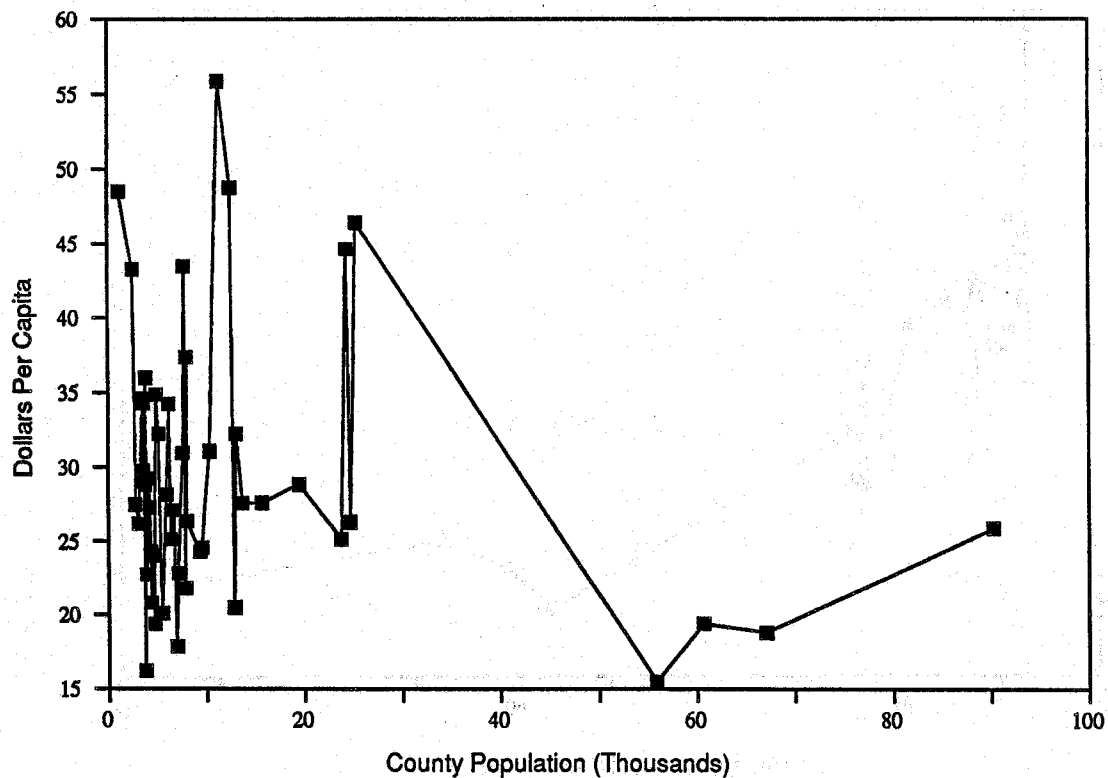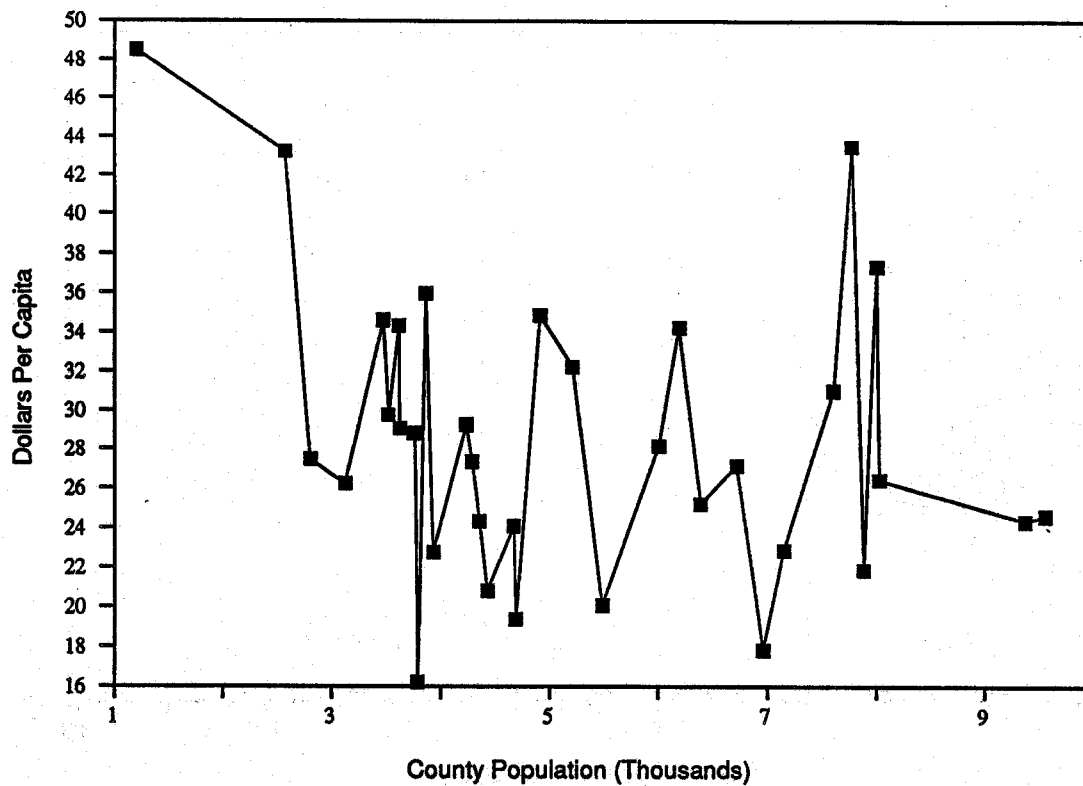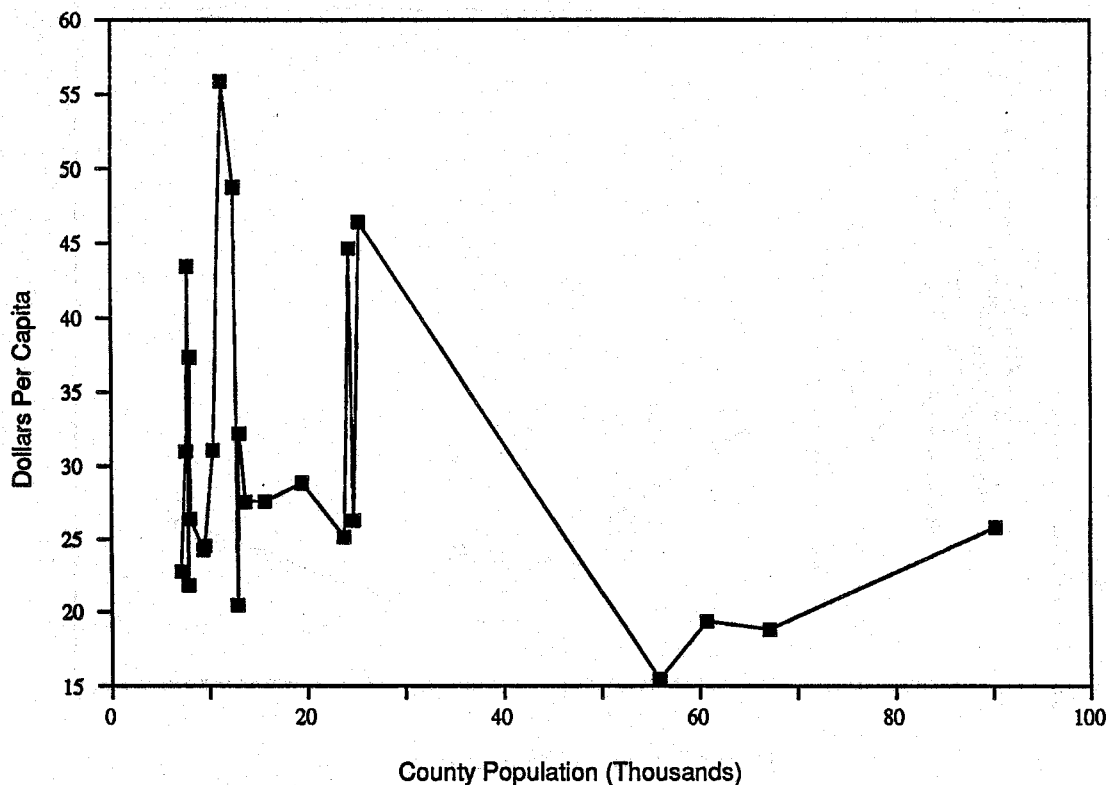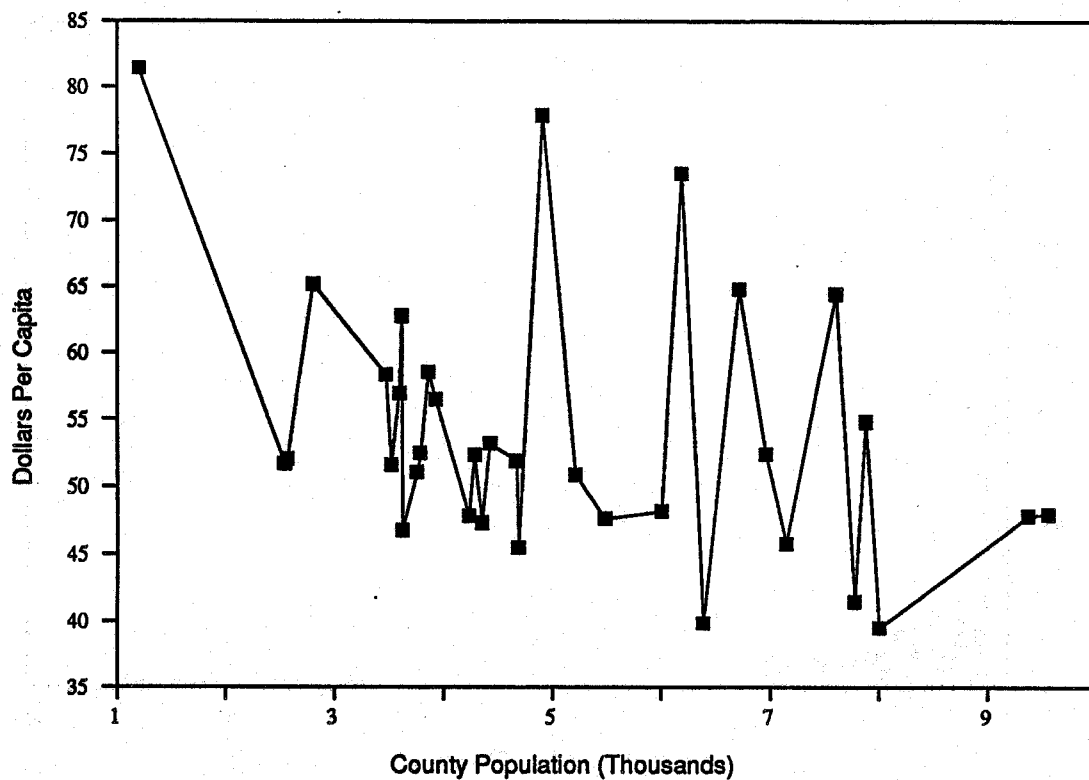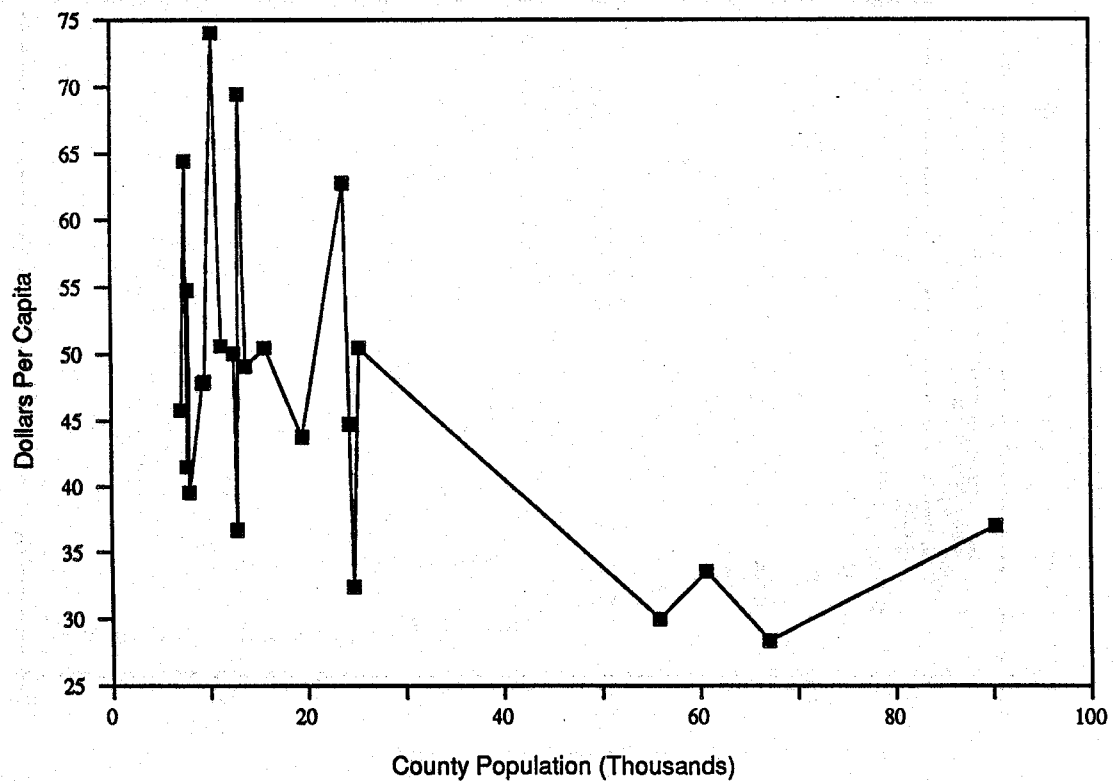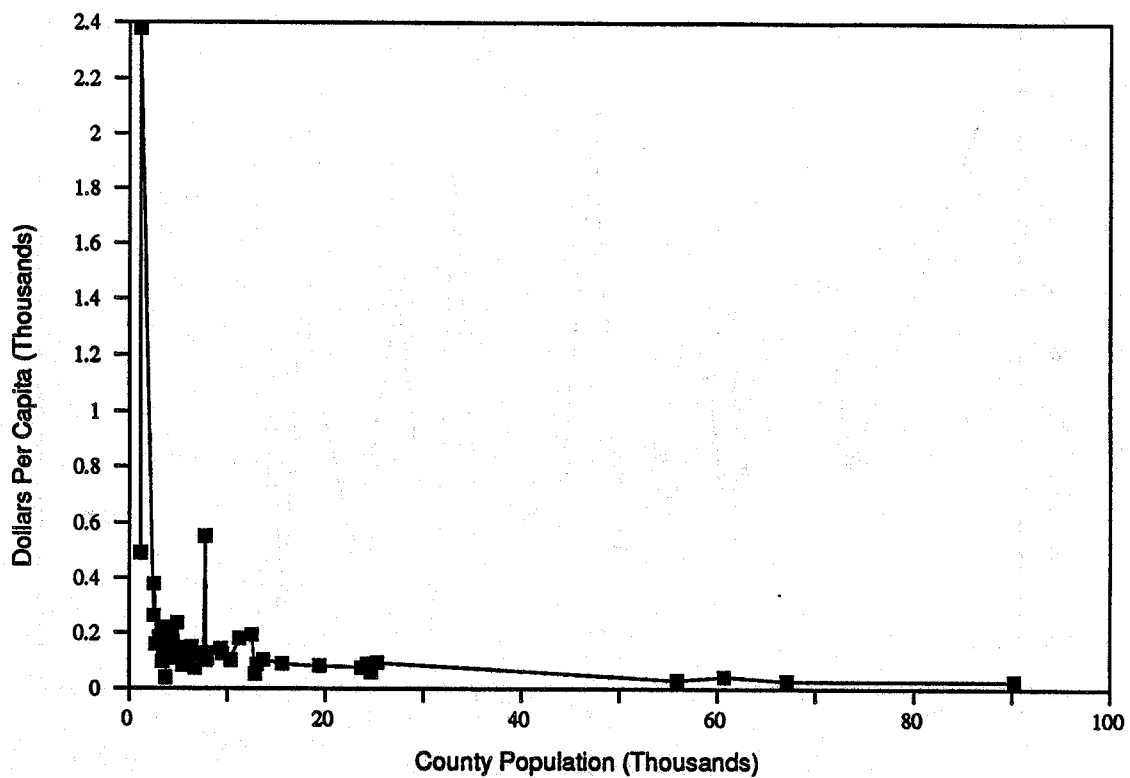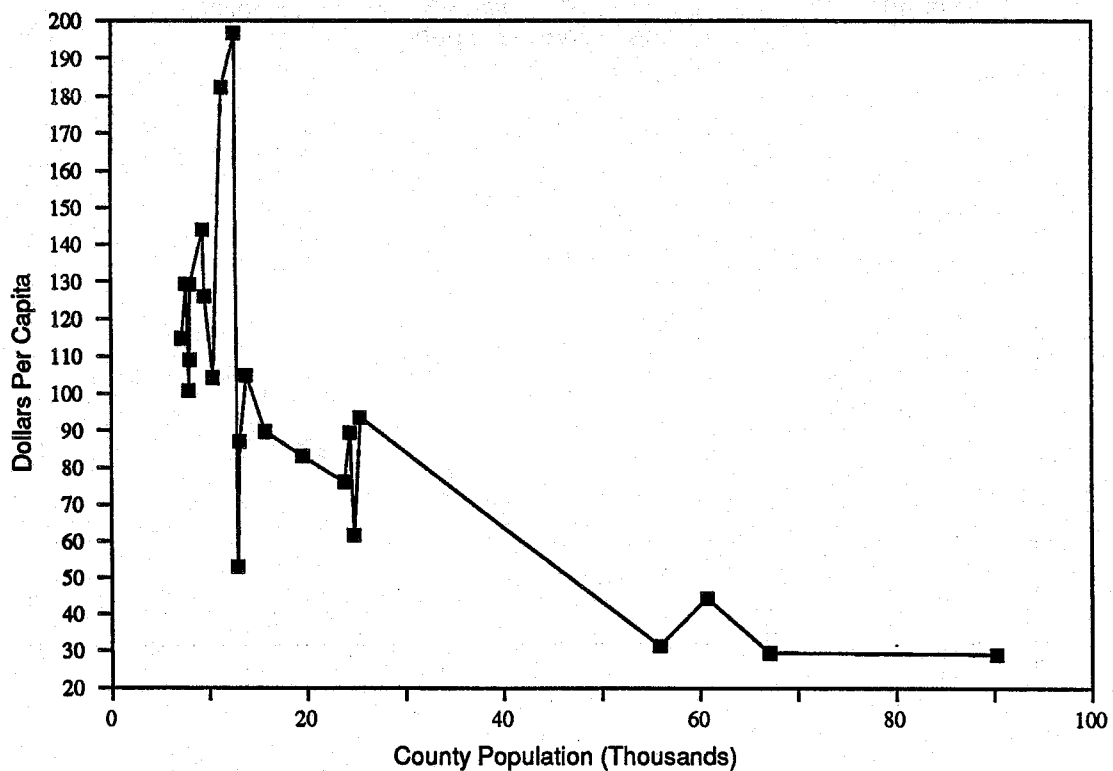   Government by Average County Population, North Dakota, 1977-1986
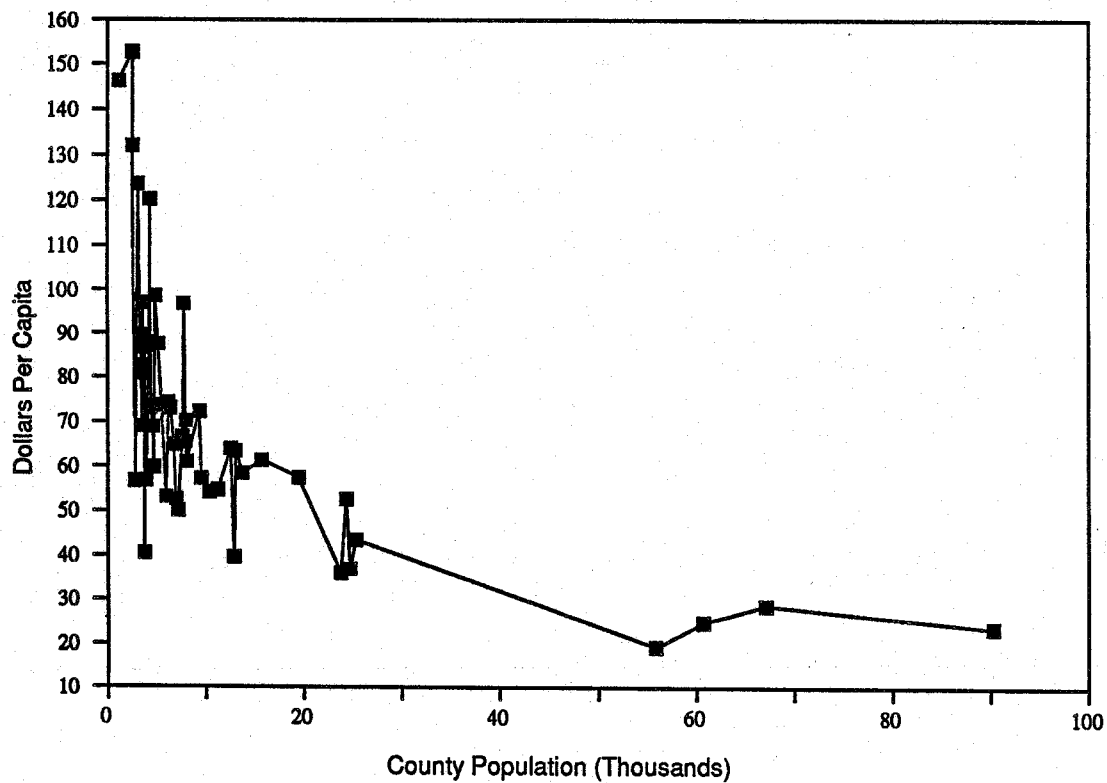
Appendix Figure F2. Average Per Capita County Spending for General Government
   by Average County Population, Except Billings County, North Dakota, 1977-
   1986
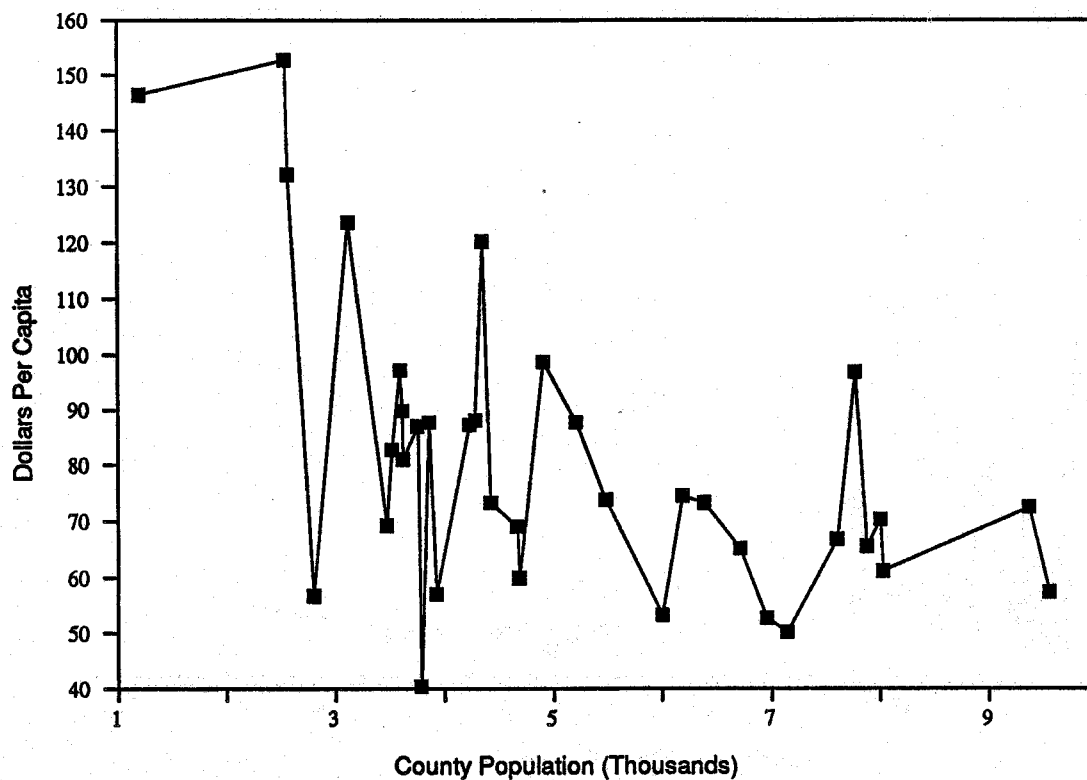
Appendix Figure F3. Average Per Capita County Expenditures for General Government by Average County Population, Excluding Billings County, Population up to 10,000, North Dakota, 1977-1986
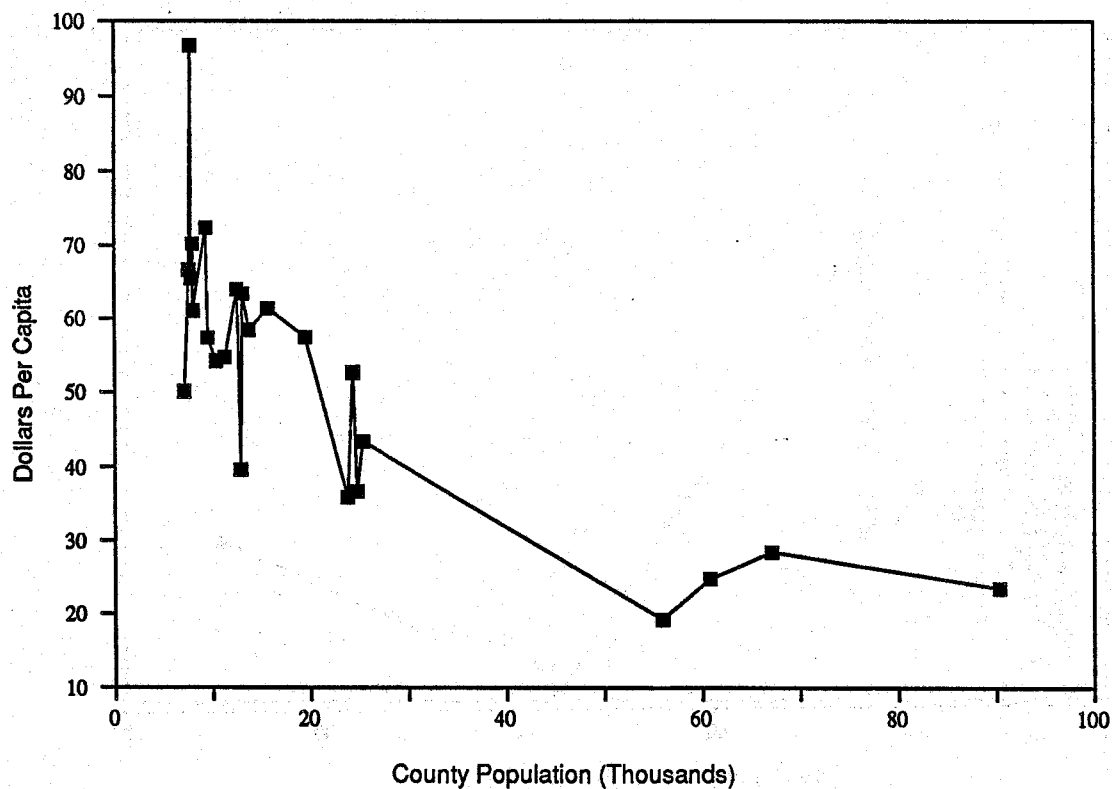
Appendix Figure F4. Average Per Capita County Expenditures for General Government by Average County Population, Population 7000 to 100,000, North Dakota, 1977-1986

Appendix Figure F5. Average Per Capita County Expenditures for Law
Enforcement by Average County Population, North Dakota, 1977-1986

Appendix Figure F6. Average Per Capita County Expenditures for Law
Enforcement by Average County Population, Excluding Billings, Golden
Valley, and Adams Counties, North Dakota, 1977-1986

Appendix Figure F7. Average Per Capita County Expenditures for Law
  Enforcement by Average County Population, Excluding Billings, Golden
  Valley, and Adams Counties, Population up to 10,000, North Dakota, 1977-
  1886

Appendix Figure F8. Average Per Capita County Expenditures for Law
  Enforcement by Average County Population, Population 7,000 to 100,000,
  North Dakota, 1977-1986
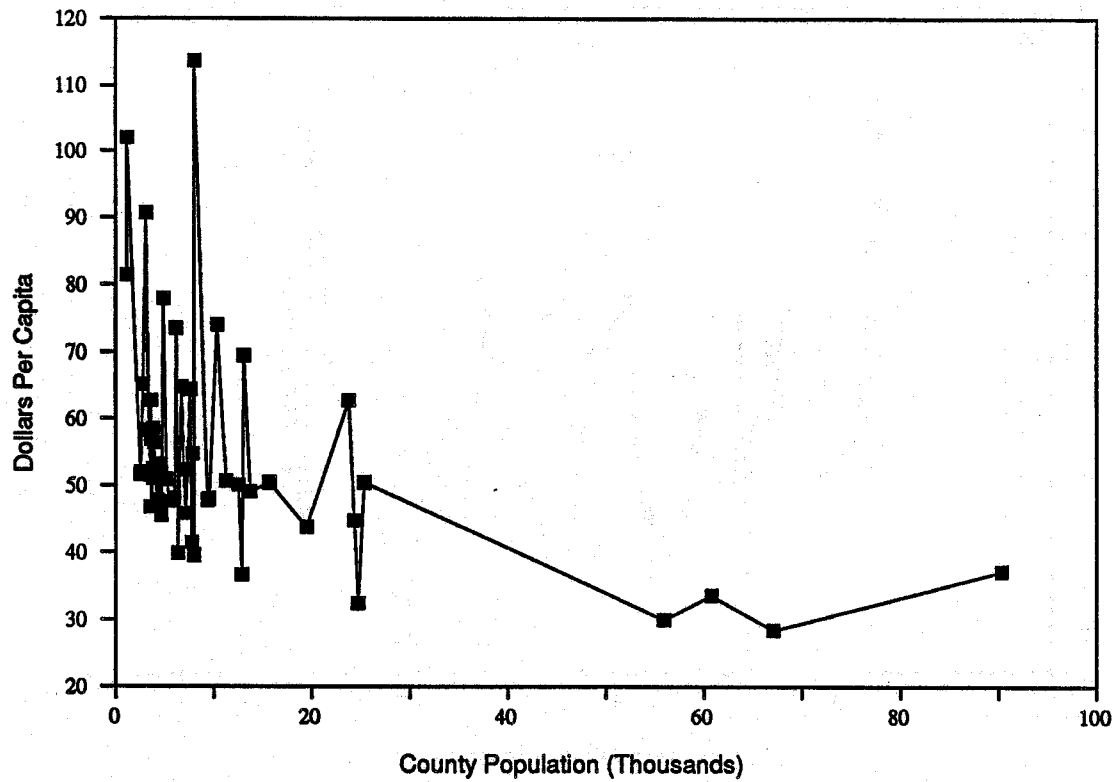
Appendix Figure F9. Average Per Capita County Expenditures for Health and
Human Services by Average County Population, North Dakota, 1977-1986
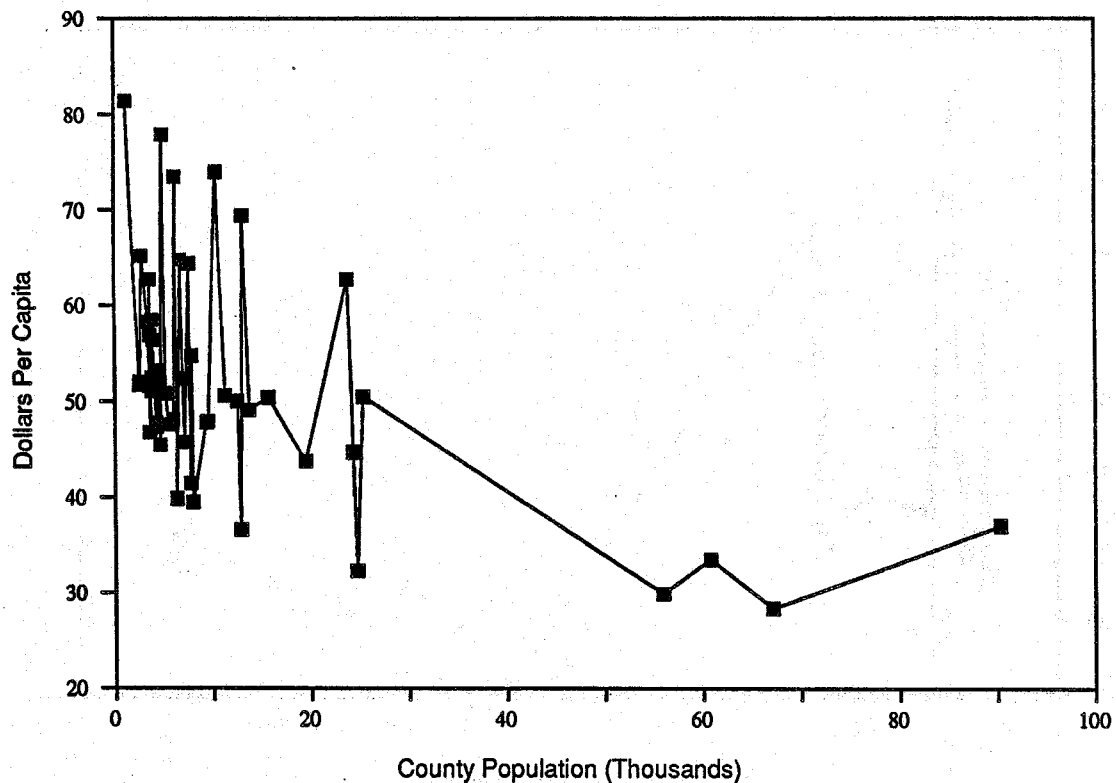
Appendix Figure F10. Average Per Capita County Expenditures for Health and
Human Services by Average County Population, Excluding Billings, Steele,
and Benson Counties, North Dakota, 1977-1986

Appendix Figure F11. Average Per Capita County Expenditures for Health and Human Services by Average County Population, Excluding Billings, Steele, and Benson Counties, Population up to 10,000, North Dakota, 1977-1986

Appendix Figure F12. Average Per Capita County Expenditures for Health and Human Services by Average County Population, Excluding Benson County, Population 7,000 to 100,000, North Dakota, 1977-1986

Appendix Figure F13. Average Per Capita County Expenditures for Highways and Roads by Average County Population, North Dakota, 1977-1986
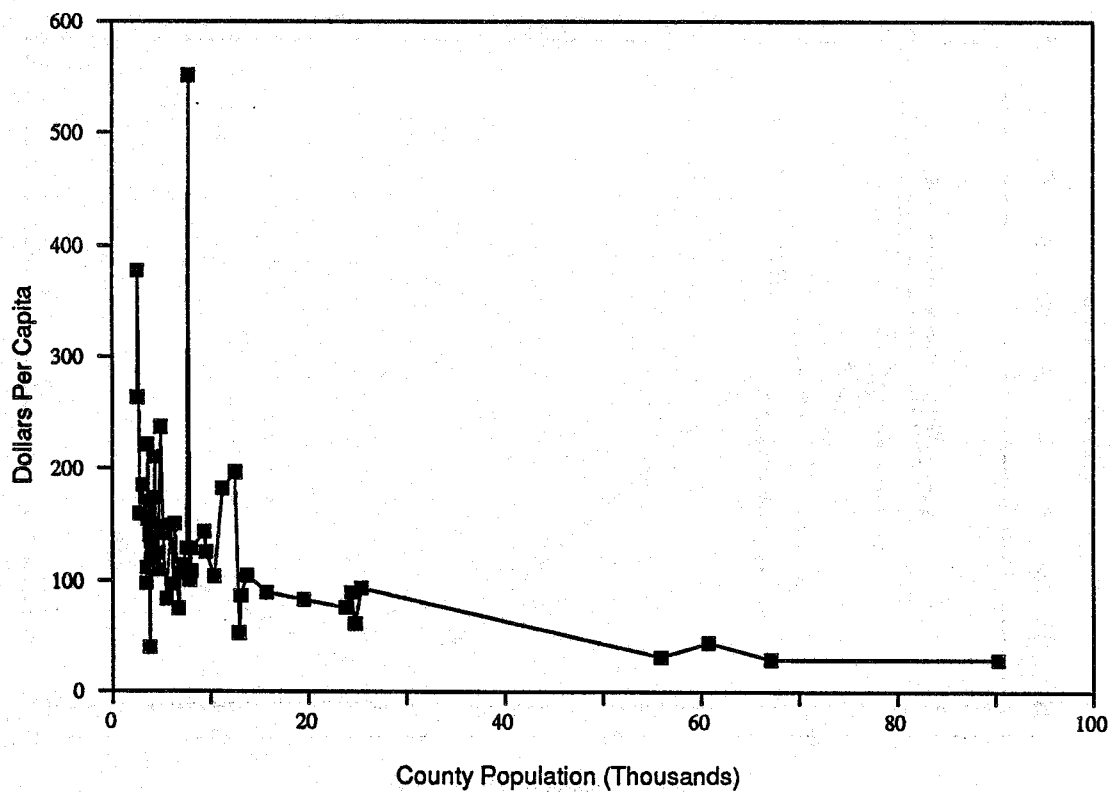
Appendix Figure F14. Average Per Capita County Expenditures for Highways and Roads by Average County Population, Excluding Slope and Billings Counties, North Dakota, 1977-1986
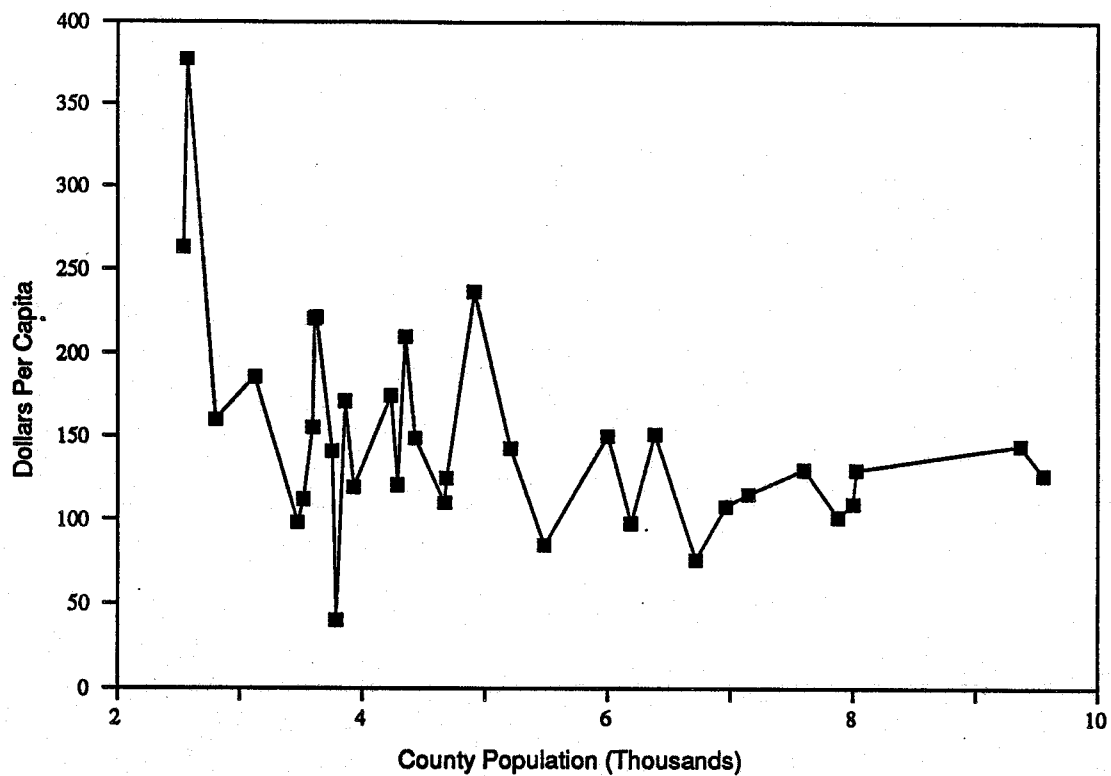
Appendix Figure F15. Average Per Capita County Expenditures for Highways and
    Roads by Average County Population, Excluding Slope, Billings, and McKenzie
    Counties, Population up to 10,000, North Dakota, 1977-1986

Appendix Figure F16. Average Per Capita County Expenditures for Highways and
    Roads by Average County Population, Excluding McKenzie County, Population
    7,000 to 100,000, North Dakota, 1977-1986

Appendix G
Distribution of North Dakota Counties' Per Capita
Expenditures for Education, Emergency, Environment,
and Miscellaneous Spending
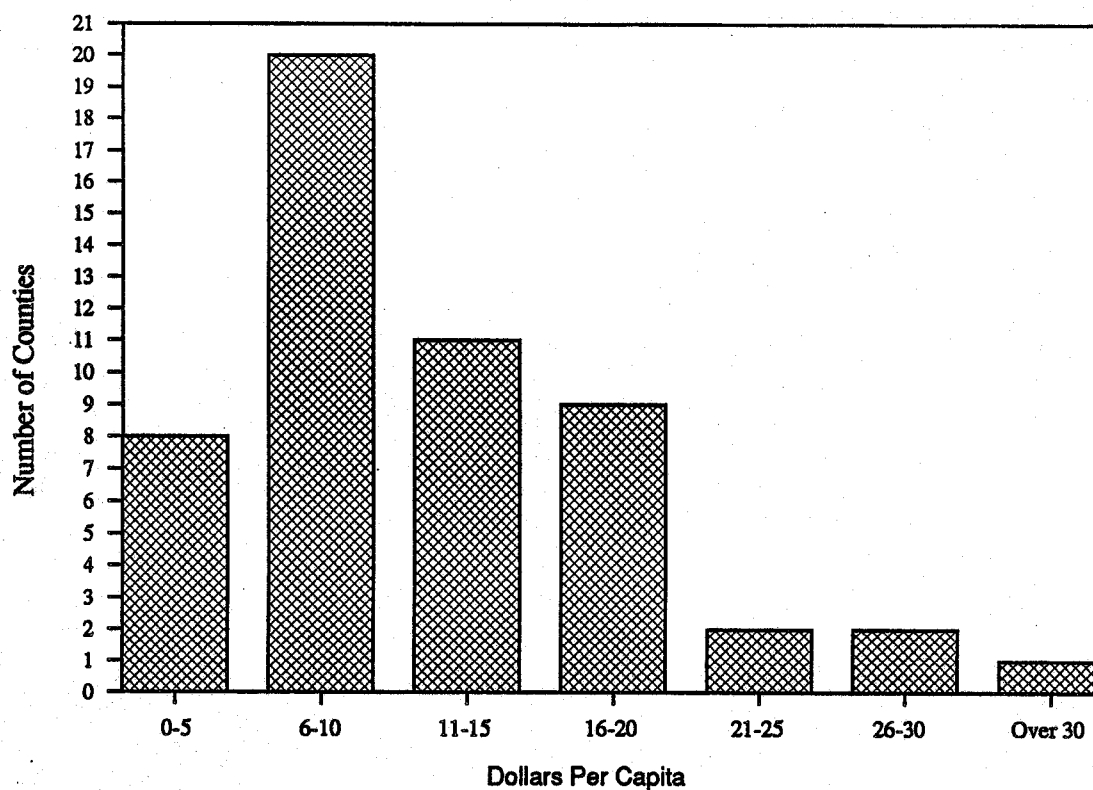
Appendix Figure G1. Distribution of Average Per Capita County Expenditures for Education, North Dakota, 1977-1986
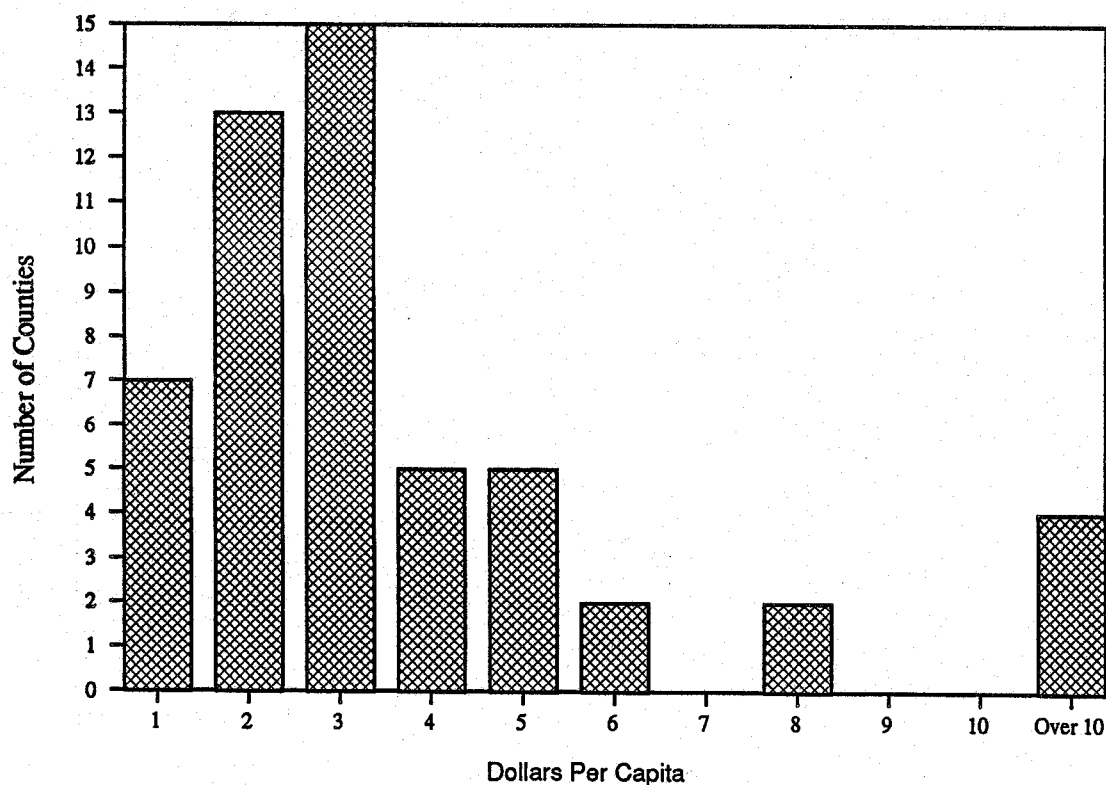
Appendix Figure G2. Distribution of Average Per Capita County Expenditures for Emergency, North Dakota, 1977-1986
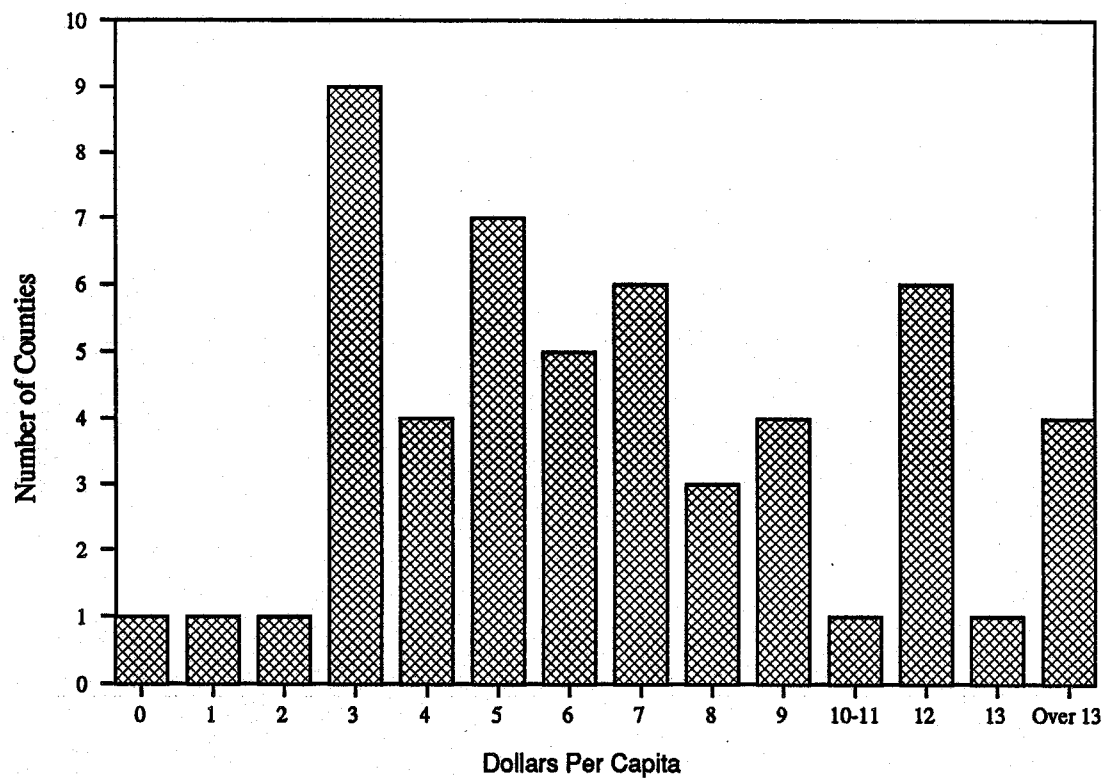
Appendix Figure G3. Distribution of Average Per Capita County Expenditures for Environment, North Dakota, 1977-1986
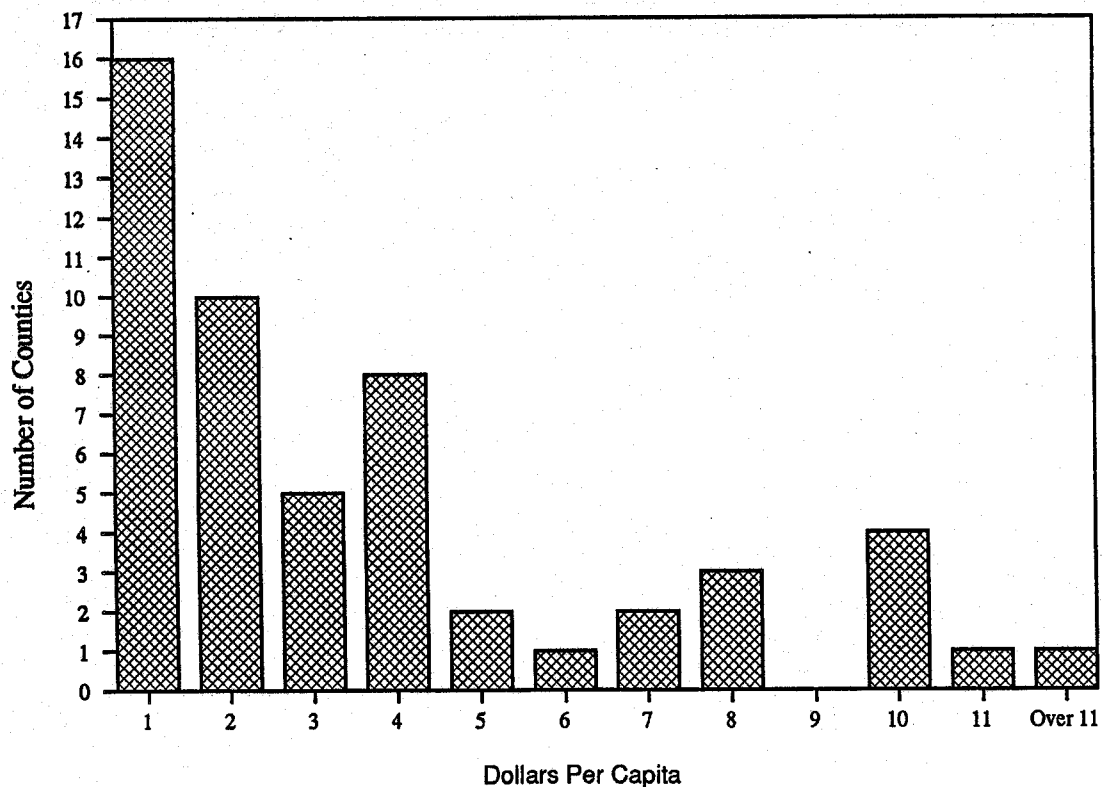
Appendix Figure G4. Distribution of Average Per Capita County Expenditures for Miscellaneous, North Dakota, 1977-1986

Appendix H
Relationship between County Land Area and Percent of Individual
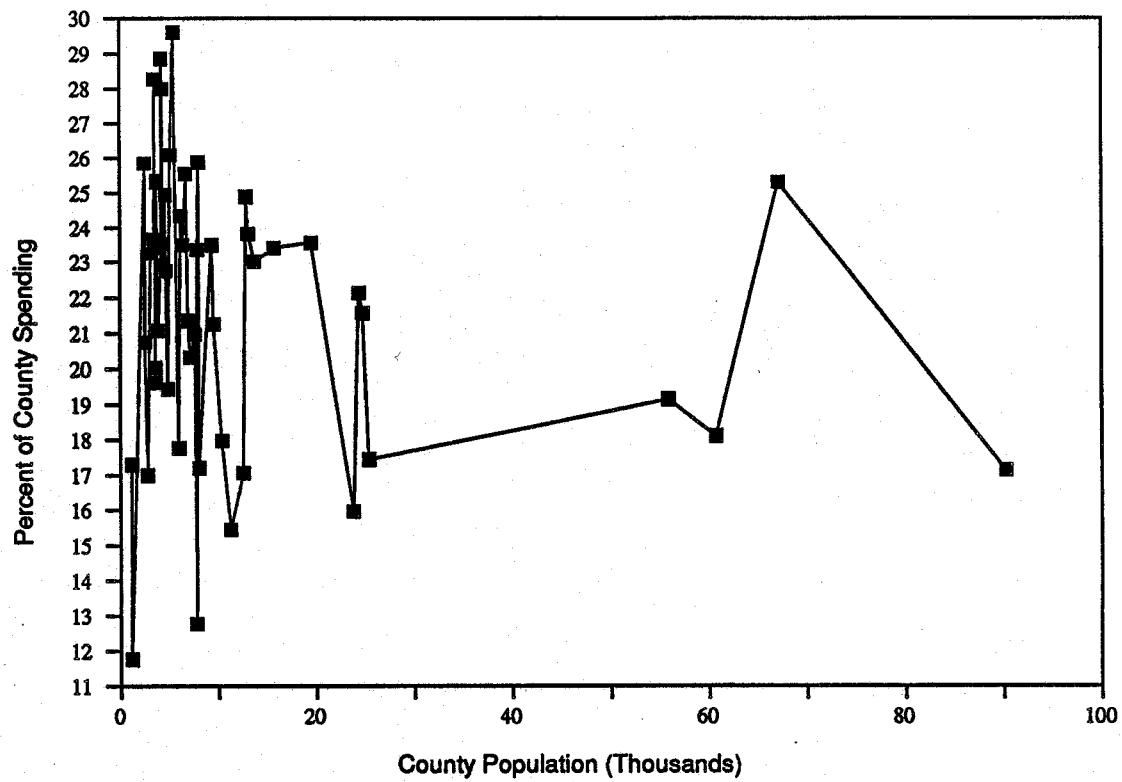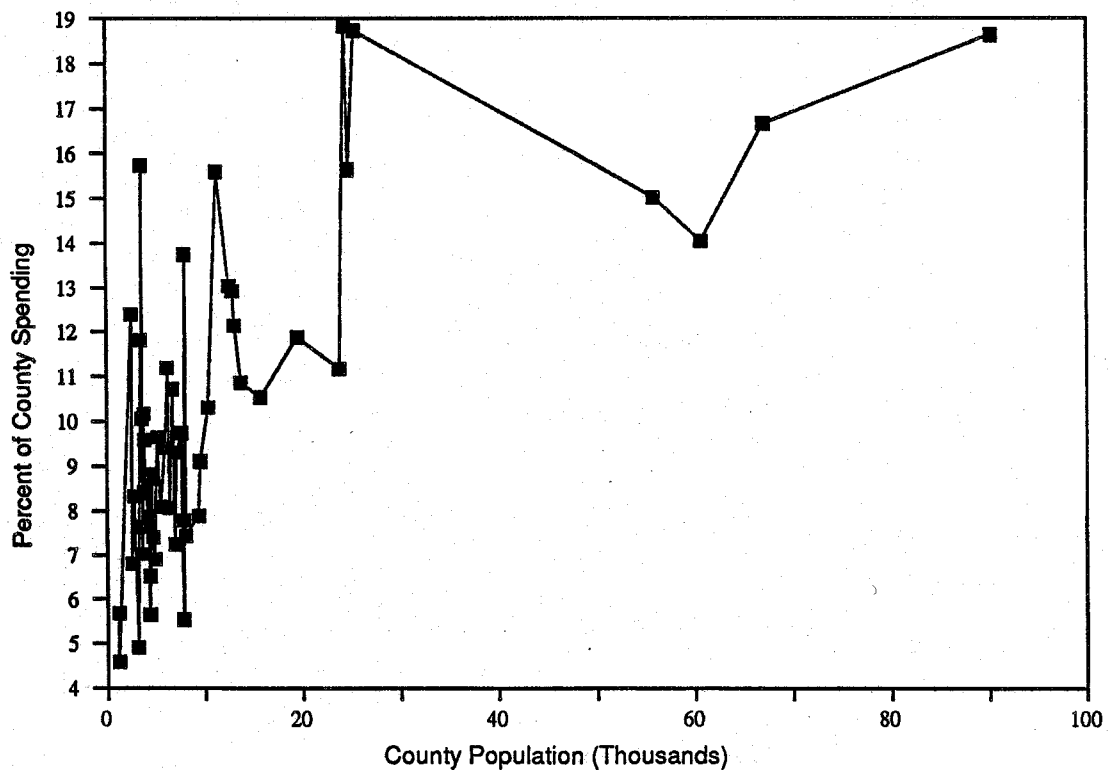North Dakota County Expenditures by Spending Category
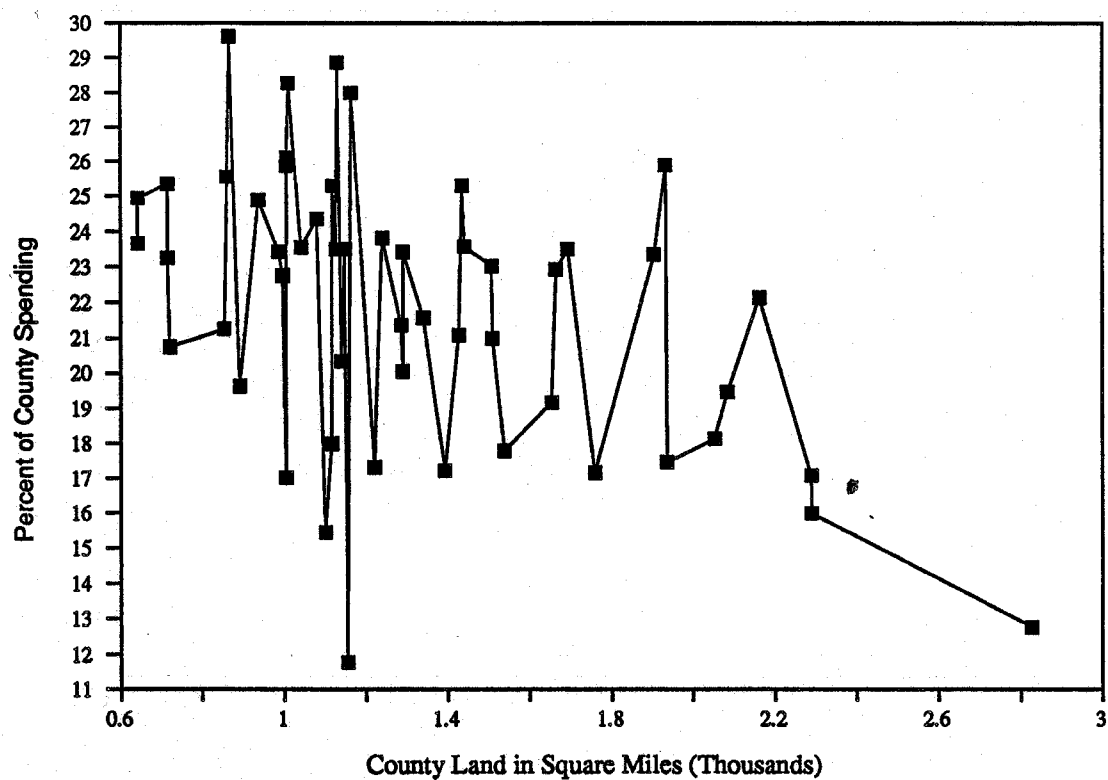
Appendix Figure H1. Average Percent of Individual Total County Expenditures for Environment by Land Area, North Dakota, 1977-1986
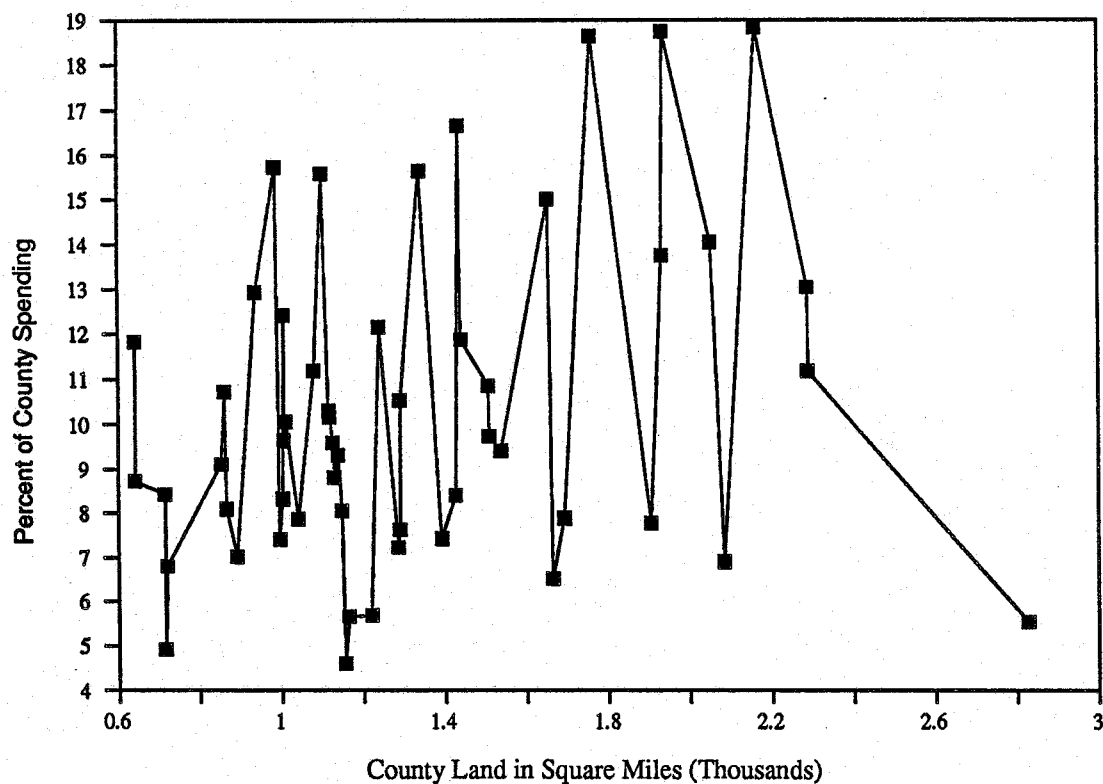
Appendix Figure H2. Average Percent of Individual Total County Expenditures for Health and Human Services by Land Area, North Dakota, 1977-1986
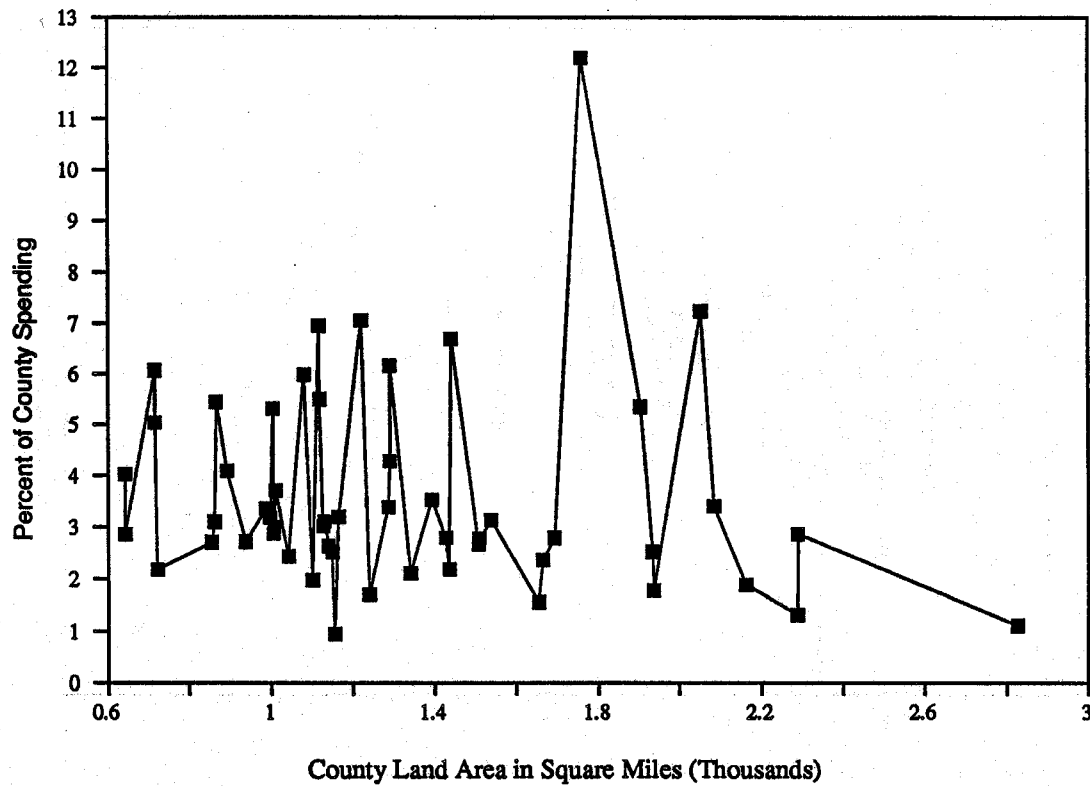
Appendix Figure H3. Average Percent of Individual Total County Expenditures
for Education by Land Area, North Dakota, 1977-1986
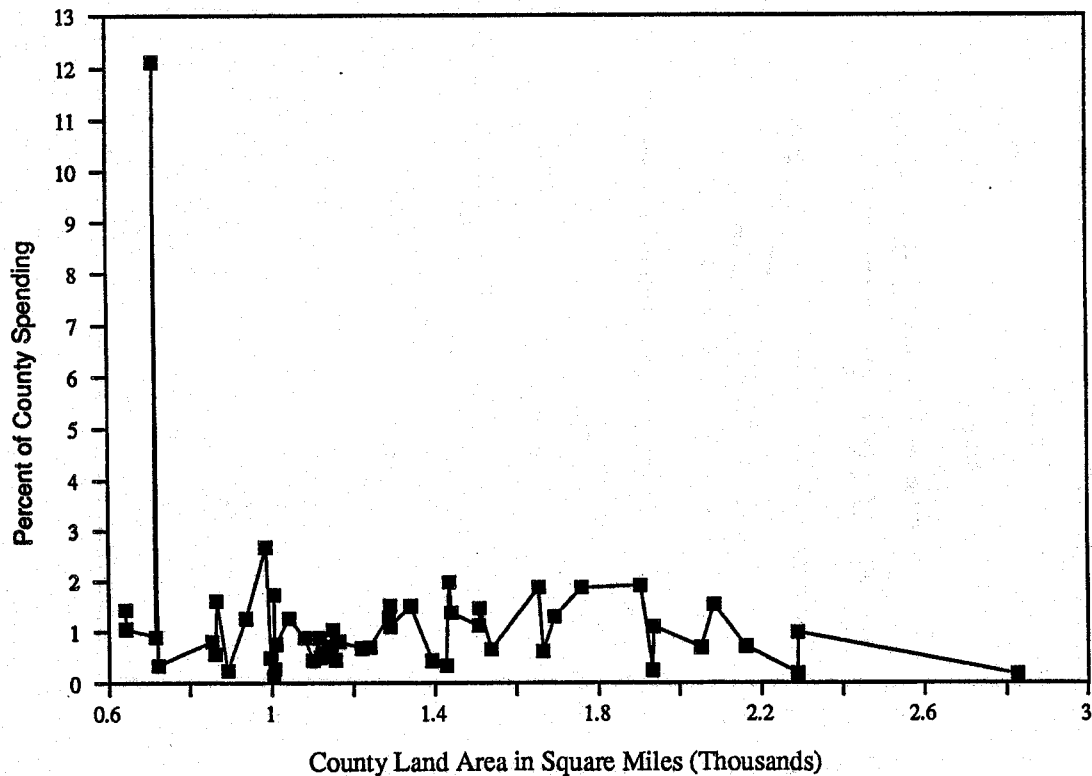
Appendix Figure H4. Average Percent of Individual Total County Expenditures
for Emergency by Land Area, North Dakota, 1977-1986
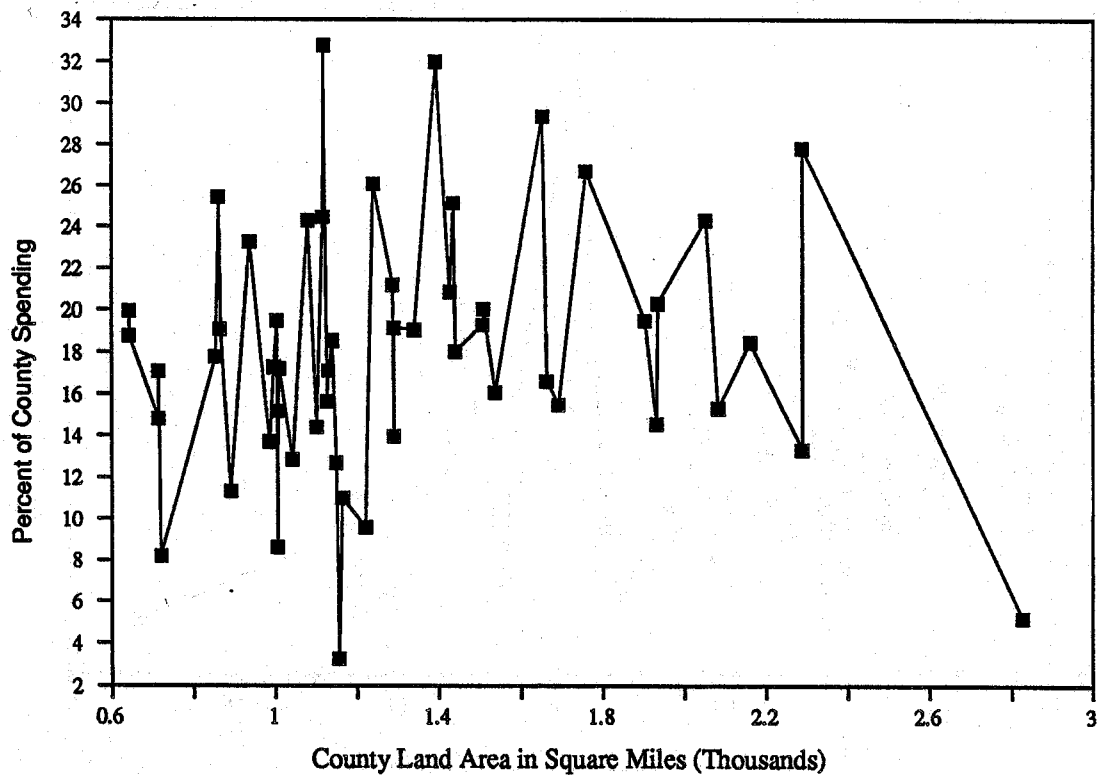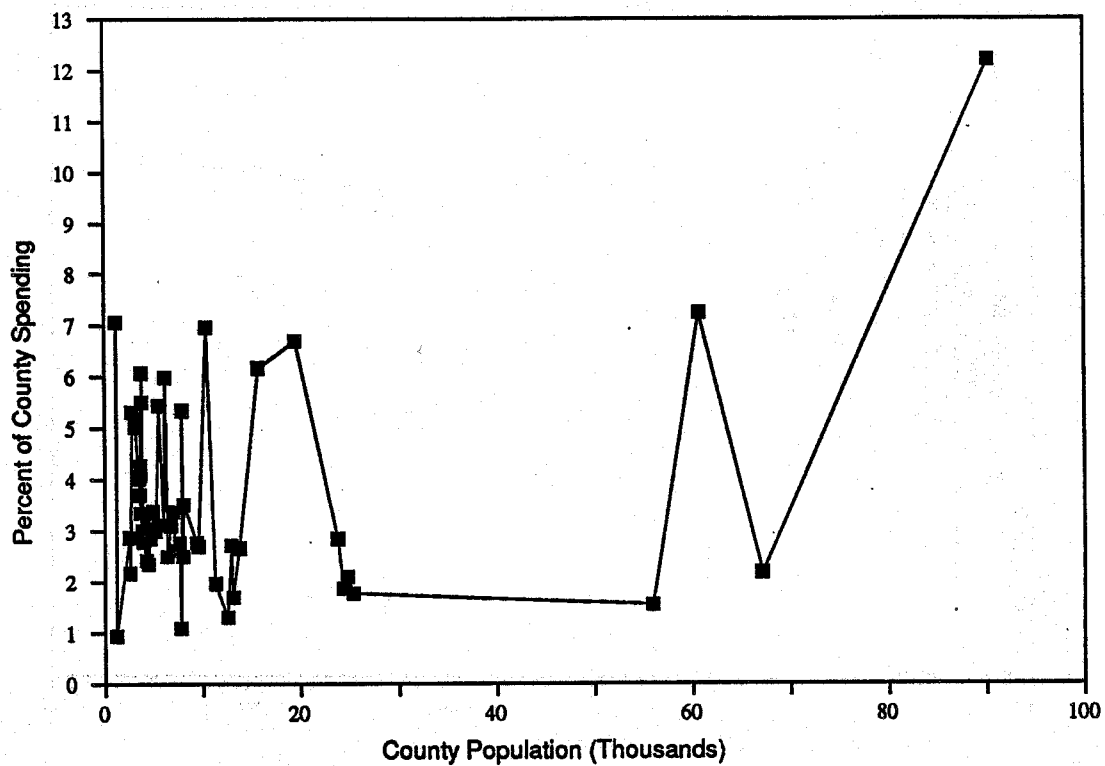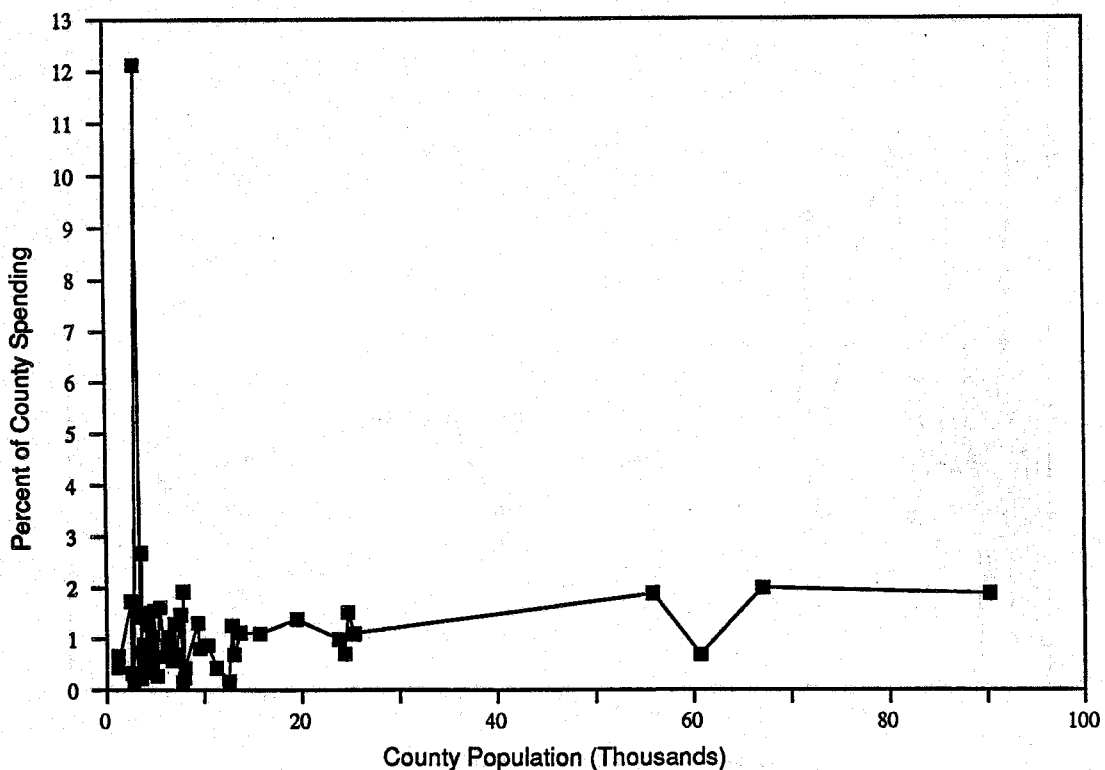
Appendix Figure H5. Average Percent of Individual Total County Expenditures for General Government by Land Area, North Dakota, 1977-1986
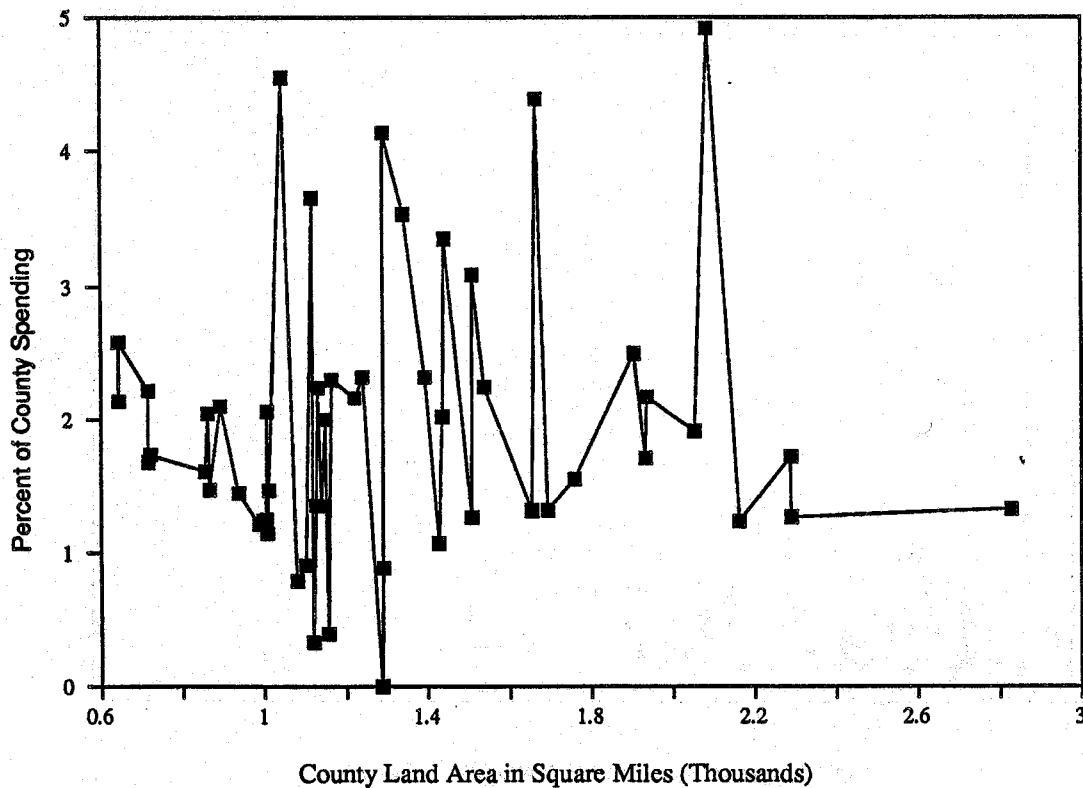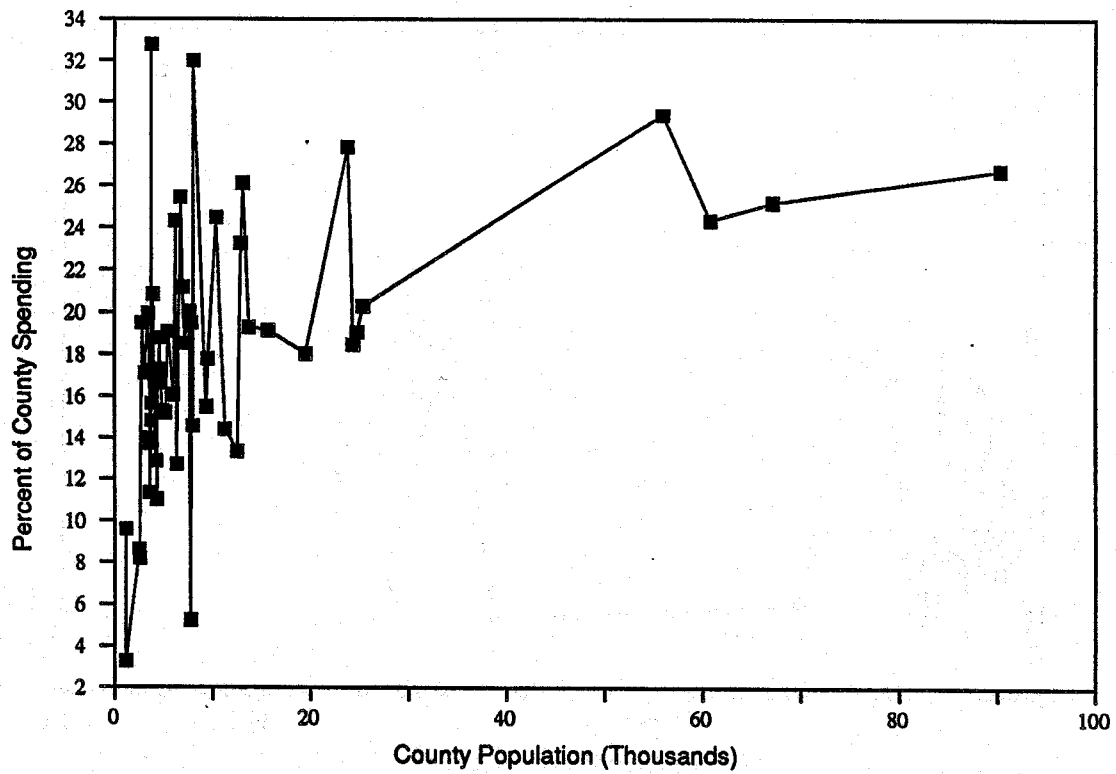

Appendix Figure H6. Average Percent of Individual Total County Expenditures for Law Enforcement by Land Area, North Dakota, 1977-1986
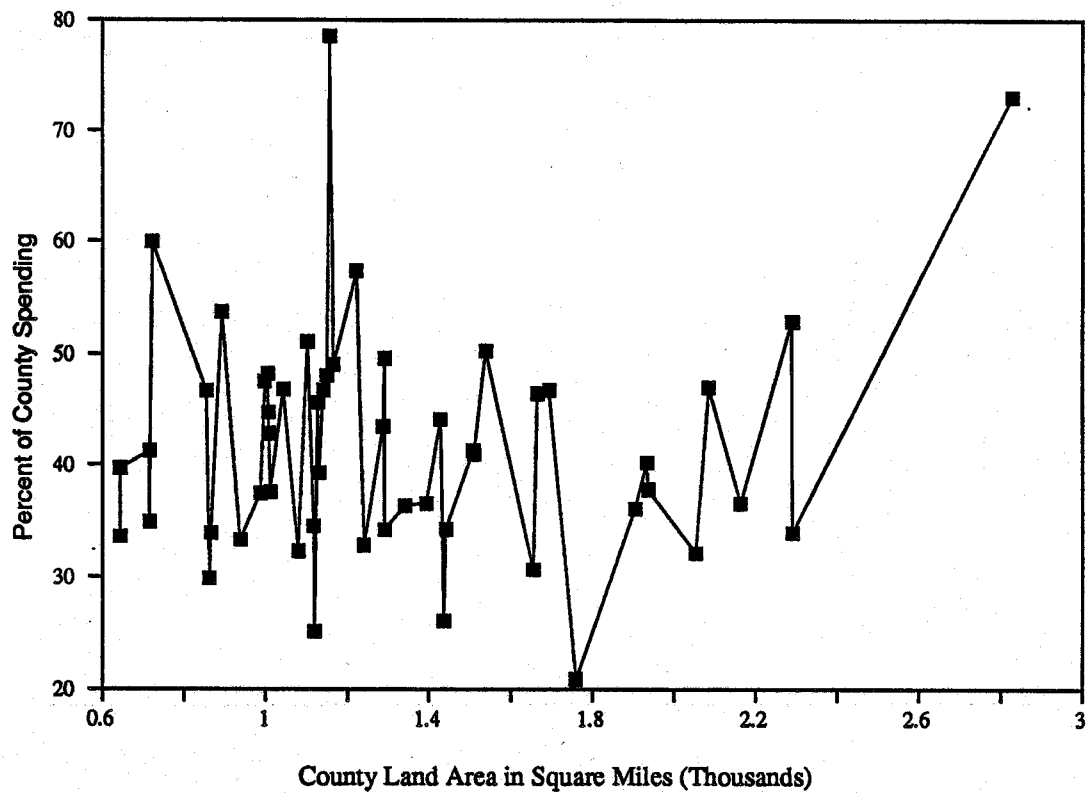
Appendix Figure H7. Average Percent of Individual Total County Expenditures for Highways and Roads by Land Area, North Dakota, 1977-1986
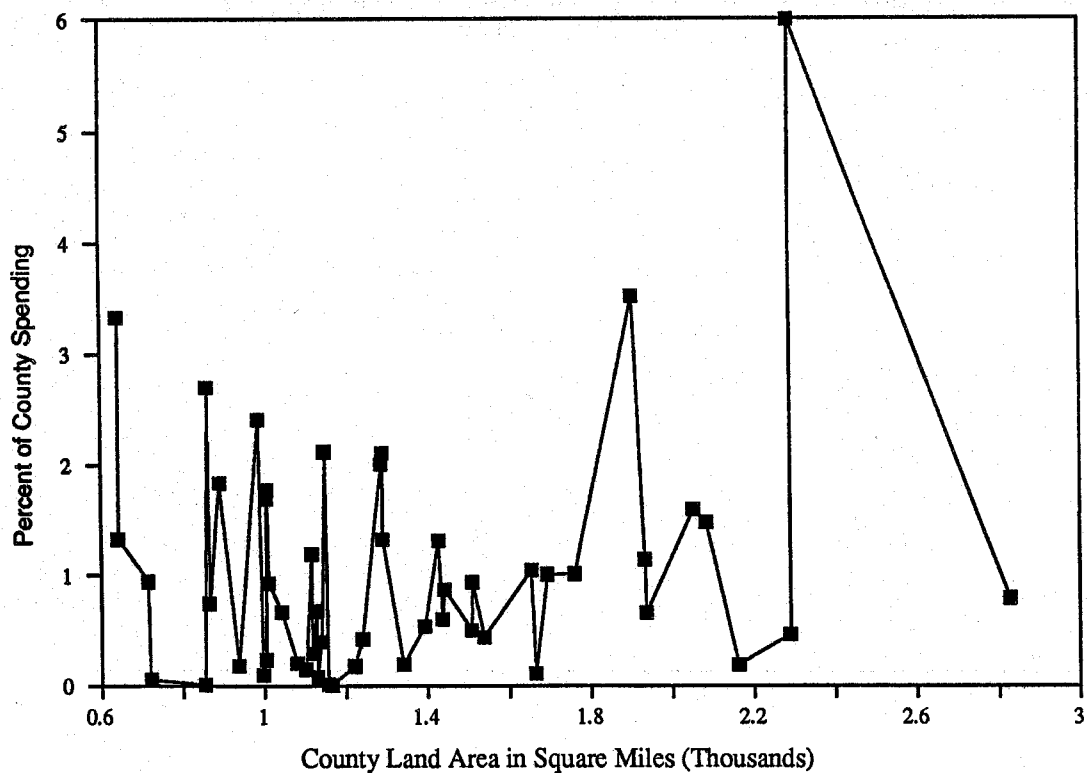
Appendix Figure H8. Average Percent of Individual Total County Expenditures for Miscellaneous by Land Area, North Dakota, 1977-1986

Appendix I
Relationship between County Population and Percent of
Individual North Dakota County Expenditures
by Spending Category

Appendix Figure I1. Average Percent of Individual Total County Expenditures for General Government by Population, North Dakota, 1977-1986

Appendix Figure I2. Average Percent of Individual Total County Expenditures for Law Enforcement by Population, North Dakota, 1977-1986
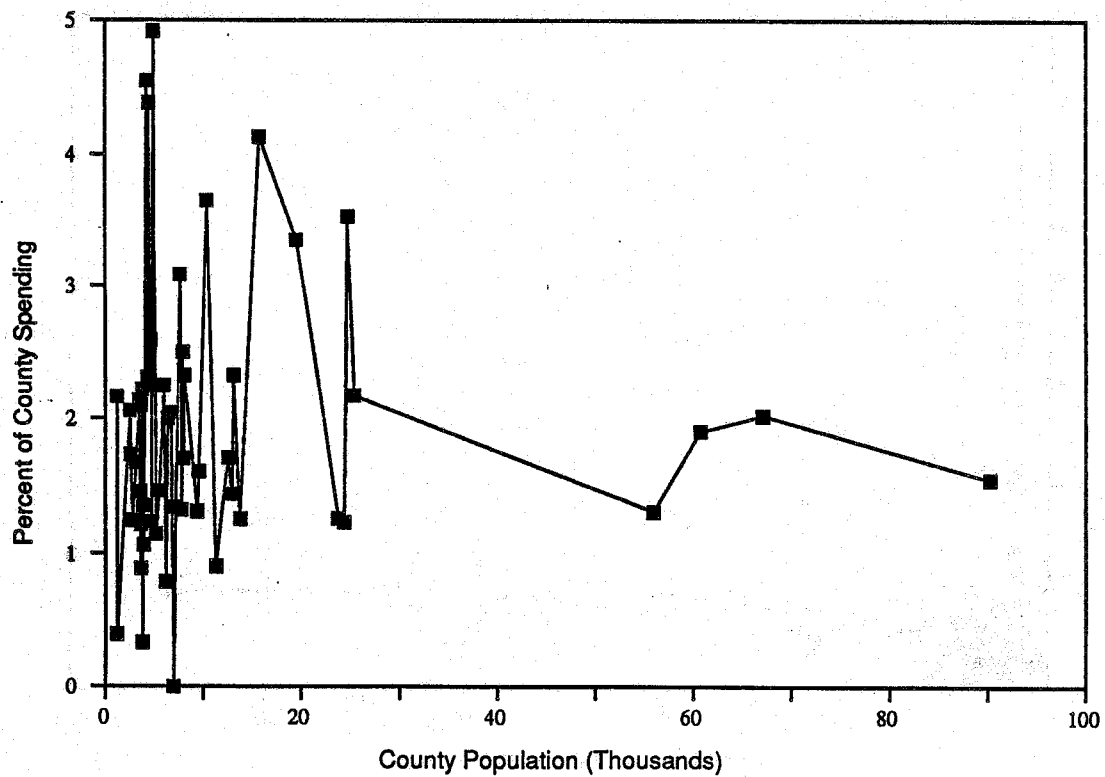
Appendix Figure I3. Average Percent of Individual Total County Expenditures for Education by Population, North Dakota, 1977-1986
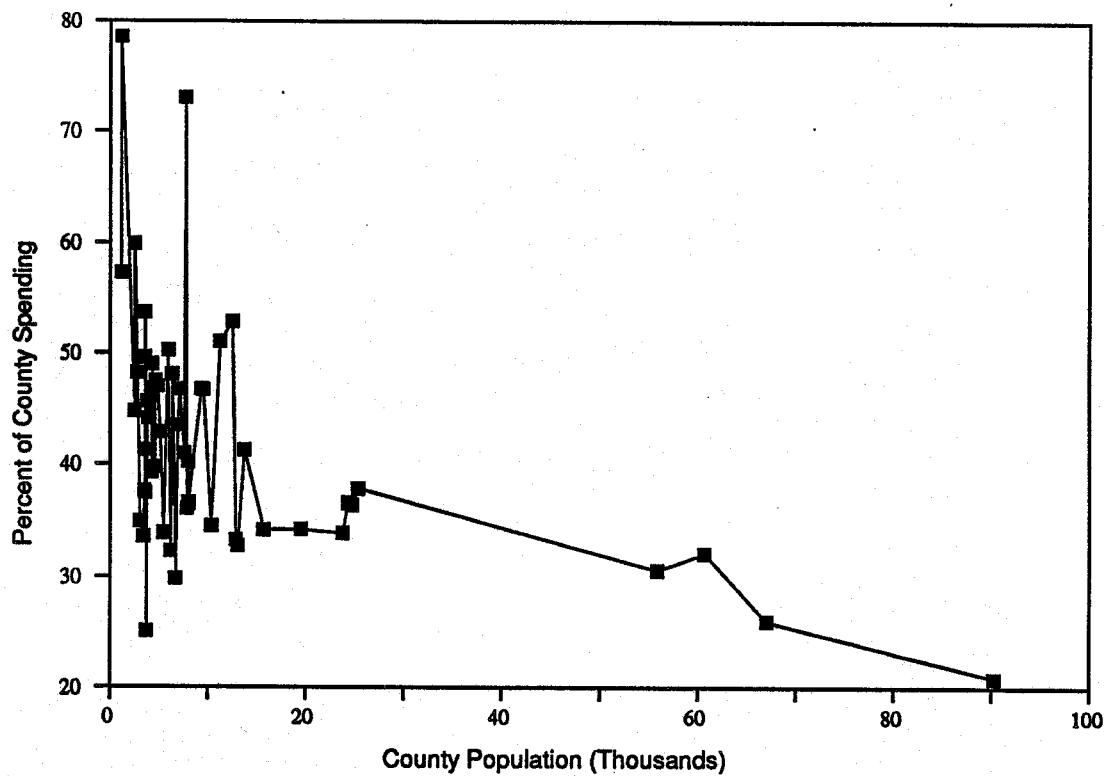

Appendix Figure I4. Average Percent of Individual Total County Expenditures for Emergency by Population, North Dakota, 1977-1986
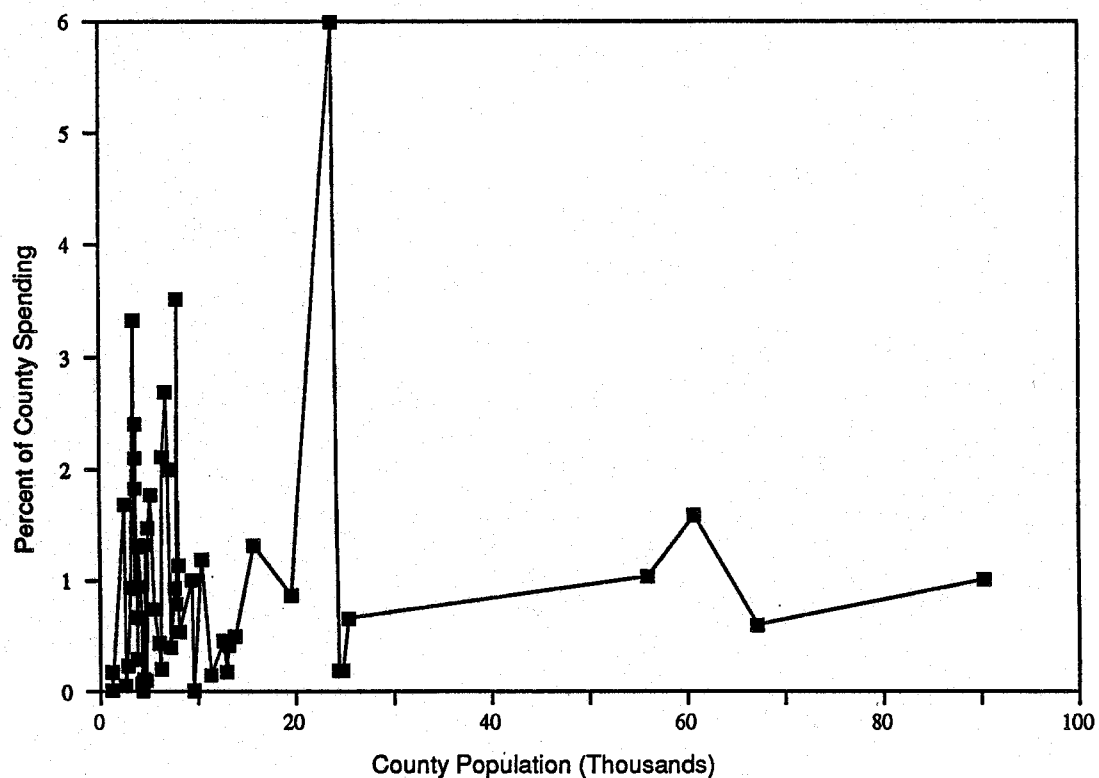
Appendix Figure I5. Average Percent of Individual Total County Expenditures for Health and Human Services by Population, North Dakota, 1977-1986

Appendix Figure I6. Average Percent of Individual Total County Expenditures for Environment by Population, North Dakota, 1977-1986

Appendix Figure I7. Average Percent of Individual Total County Expenditures for Highways and Roads by Population, North Dakota, 1977-1986

Appendix Figure I8. Average Percent of Individual Total County Expenditures for Miscellaneous by Population, North Dakota, 1977-1986