The Fiscal Impacts of Use-Value Taxation in Prince William County, Virginia

by

Cheryl Fung

Thesis submitted to the Faculty of the

Virginia Polytechnic Institute and State University

in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

in

Agricultural and Applied Economics

APPROVED:

Dr. Thomas G. Johnson, Chair

Dr. Waldon Kerns

Dr. Daniel B. Taylor

November 1995

Blacksburg, Virginia

c.2

LD
5655
V855
1995
F864
c.2

THE FISCAL IMPACTS OF USE-VALUE TAXATION

IN

PRINCE WILLIAM COUNTY, VIRGINIA

by

Cheryl Fung

Dr. Thomas G. Johnson, Chair

Agricultural and Applied Economics

(ABSTRACT)

Concern that high property taxation of agricultural land encourages its conversion to nonagricultural uses has led to the adoption of use-value taxation practices. Use-value taxation has had mixed results as a deterrent to the conversion of agricultural and open space land. It has been argued that use-value taxation does not succeed in retaining open space along the rural-urban fringe (Stocker 1975; Ferguson), and further that such programs may actually lower the community's property tax base significantly (Tiebout; Anderson 1993). Additionally, when land is taxed by its use-value rather than market-value, the local tax base declines curtailing local public services and consequently reducing the attractiveness of the community for residential, commercial and industrial land uses (Abeyratne and Johnson, Bickerdike, Netzer, Oates).

This study seeks to determine the fiscal impacts of use-value taxation and alternative land uses. Fiscal impact analysis seeks to measure direct public costs incurred and immediate revenues generated by a particular land use project. By comparing the net impact on the property tax rate of different land uses, the effectiveness of land use taxation policies for communities can be determined.

The fiscal impact of alternative land uses are measured using The Virginia Impact Projection (VIP) model. The empirical models employed are based on a static cross-sectional econometric analysis of Virginia counties initially developed by Johnson and Keeling and updated for the current analysis using more recent data. The empirical equations are used to construct a fiscal impact assessment (simulation) model. The simulation model allows the comparison of impact and baseline scenarios developed using alternative land uses.

It was found that the impact of farmland enrollment in use-value assessment programs is not as large when net impacts are considered rather than sole consideration of the direct property tax revenue changes.

Keywords: Use-value taxation, land use, real property tax base, market value of real property, assessed value of real property, proportion of agricultural property in total property, effective assessment rate of agricultural property, exemptions, fiscal impact analysis, revenues, expenditures, Virginia Impact Projection (VIP) model

Acknowledgments

I would like to thank Dr. Thomas G. Johnson for his encouragement and patience in guiding and supporting my research for this thesis. I would like to also express my gratitude to my committee members Dr. Waldon Kerns and Dr. Daniel B. Taylor. My sincere thanks to all those who both directly and indirectly made this study possible; in particular, I would like to thank Mr. Richard Lawson of Prince William County, Office of the County Executive for providing much needed data for this study.

Finally, I would like to thank my parents, my first teachers, for their support and encouragement. I continue to learn from them today. A special thanks to Peter for his support and to Alexander, who told me if I wrote a page a day I would be done in no-time.

Contents

Tables

I Introduction

Use-value taxation programs have been enacted as a means toward a) preserving open space and; b) matching landowners' tax bills to their utilization of public services (Barlowe, Ahl, and Bachman; Hady and Sibold; Keene). However, there has been some debate as to the programs' effectiveness in meeting these objectives. The practice of and dispute over, the success of use-value taxation programs is evident in areas along the rural-urban fringe. This is due to the resurgence of growth in non-metropolitan areas surrounding population centers. While economic growth creates jobs and economic opportunity, the benefits of growth are not necessarily shared widely within the local population. In particular, economic growth can have disparate impacts across landowners. From the standpoint of the locality, this study proposes to assess the fiscal impacts of use-value taxation. It is designed to provide information about the overall fiscal effects of use-value assessment as an effective land use policy.

Traditionally, land has been treated solely as a factor of production along with labor and capital. Activities in which land is an input include the production of food and fibers, and energy and mineral resources. Residential properties, recreation areas and open spaces can be considered as productive goods but in fact, such nonagricultural land uses are usually regarded as consumption (Keene). On the other hand, as populations have grown and regions developed, land has come to be regarded as an asset rather than as just a source of natural resources. Land is valued for its space, location relative to other things, and amenities. For the individual (the investor), land is regarded as a resource (real estate) that can be purchased or leased like any other capital good. The land market arises from the capitalization of land rent (land income) into land values (Harmston). The land use and ownership aspect of land economics provides the method of determining the distribution of rent (income) across individuals. In summary, individuals may consider land differently than does society.

I.1 Problem

According to Vesterby, Heimlich and Krupa (1994), the quantity of agricultural land has diminished due to declining farm profitability, rising property taxes, expanding urban areas, and mounting land values. Yet growing communities along the rural-urban fringe prefer to retain their rural character (Furuseth; Vesterby, Heimlich, and Krupa). Public debate on the issue of farmland conversion in the United States has suffered from the lack of a well-developed rationale for evaluating alternative farmland preservation policies as well as from a lack of sound empirical evidence on the magnitude of land conversion (Fisher). According to Fisher, the problem is twofold: (1) the magnitude and irreversibility of farmland conversion and their implications for food production, and (2) the spatial pattern of urbanization and the related costs and benefits.

Addressing Fisher's first concern, it has been argued that farmland conversion on the rural-urban fringe is rapidly depleting the nation's supply of prime farmland: land that is best suited to producing food and fiber (National Agricultural Lands Study, 1981; Vining, Plaut, and Bieri). However, a recent study conducted by the United States Department of Agriculture, entitled *Urbanization of Rural Land in the United States*, concludes that loss of farmland to urbanization does not threaten total cropland or the level of agricultural production. Current levels of production were found to be sufficient to meet food and fiber demand into the next century. It was also determined that despite losses to urbanization, cropland has remained nearly constant since World War II. Urban land is only 2.5 percent of the U.S. land area, so even a large increase in urbanization involves little land in proportion to the U.S. total (Vesterby, Heimlich, and Krupa).

Notwithstanding, urban growth has had an impact on the spatial distribution of land uses. In particular, there exists a lack of continuity in land use expansion patterns on the urban periphery. Leapfrogging or sprawl are terms used to describe the haphazard pattern of land development in which large tracts of developed and undeveloped land alternate (Clawson; Hart). Land use changes due to urban sprawl have resulted in rapidly rising property values; rising property values lead to higher assessments and increased taxes. Thus, haphazard urbanization has burdened individual landowners (Keene). Also, leapfrogging leads to more rapid propagation of the rural-urban fringe than would a concentrated pattern of development. Proactive land use planning could balance demands for open space against the burdens that sprawl creates, in effect *managing* the propagation of the rural-urban fringe.[1]

An important concern over the loss of rural land is that when agricultural land is developed for nonagricultural uses in rapidly growing areas, "open space" is lost. The Commonwealth of Virginia defines open space as . . .

> . . . real estate used as to be provided or preserved for park or recreational purposes, conservation of land or other natural resources, floodways, historic or scenic purposes, or assisting in the shaping of the character, direction, and timing of community development or for the public interest and consistent with the local land-use plan, under uniform standards prescribed by the Director of the Department of Conservation and Historic Resources pursuant to the authority set out in Section 58.1-3240, and the local ordinance (Section 58.1-3230 of the *Code of Virginia*, Commonwealth of Virginia, State Land Evaluation Advisory Council, 2-3).

Open space and the associated environmental amenities are considered public or collective goods. Samuelson (1954) defines public goods as "collective consumption goods which all enjoy in common in the sense that each individual's consumption of such a good leads to no subtraction from any other individual's consumption of that good (179)." The value of preserving the amenity benefits of agricultural land is difficult to quantify. One measure of benefits from public goods is the community's willingness to pay for the good. Land use taxation programs provide tax subsidies as a means to preserve open space instead of obtaining direct public ownership. This subsidy can be considered a measure of the willingness to pay for the preservation of open space. However, the literature suggests

[1]This issue is not directly addressed at great length since it would demand consideration of various alternatives for "open-space" preservation. It will be noted in subsequent discussion that the literature suggests that use-value taxation by itself is *not* effective in changing the pattern of land use expansion.

that these programs do not succeed in preserving farm land from commercial development, only delaying such development (Stocker 1961, 1975; Barlowe, Ahl, and Bachman; Anderson 1986, 1993; Fisher 1982; Ferguson 1988).

Further, employment and population growth increase the demand for local services which, in turn, require the collection of revenues to meet the higher cost of providing services. The major source of revenue for local governments is local property taxes (Wunderlich and Blackledge). Thus, if the demand for services increases, the local property tax collections must generally rise. Property tax revenues can rise due to an increase in the tax base or an increase in the tax rate. If the property tax base rises in proportion to expenditure growth, it is not necessary to raise the tax rate. However, if the tax base does not expand in proportion to revenue demands, the tax rate must rise or public services be curtailed.

Real property is assessed on the basis of acreage and improvements. Most property owners are willing to pay some increased property taxes as long as they benefit from expanded local public services. However, the services required per acre of farmland will likely be less than those required per acre of a residential or commercial subdivision. The services paid for by taxes and those consumed may differ for each landowner. The disparity increases when land values are inflated due to urban development and speculation. This equity issue has lead to assessment practices based on both use-value and market-value of land.

I.1.1 Use-Value Assessment

Concern that high property taxation of agricultural land encourages its conversion to nonagricultural uses has prompted the enactment of tax legislation to preserve agricultural, forest and open space land. The most widely used tax program designed to retard the loss of agricultural land is use-value or differential assessment (National Agricultural Lands Study 1981). These laws provide for the valuation of land on the basis of its use-value rather than its market-value. Use-value assessment can be classified into three general categories: preferential assessment, deferred taxation and restrictive agreements (Stoll, et. al.). Preferred assessment allows eligible land to be valued according to its current use rather than its market-value; there is no penalty for land use conversion. Deferred taxation allows eligible land to be valued on the basis of current use rather than market-value with the requirement that the landowner pay a penalty (usually the previously exempted tax) in the event that the land is converted to another use. Restrictive agreements are covenants made by the local government and individual landowners in which the landowners agree not to convert the use of land for a given time period in exchange for differential assessment (Hady and Sibold).

I.1.2 Use-Value Assessment in Virginia

Virginia's Use-Value Taxation program is described in the Manual of the State Land Evaluation Advisory Council (1988) as follows:

> In 1971, the Virginia General Assembly enacted a law permitting localities to adopt a program of special assessments for agricultural, horticultural, forest, and open space

lands (Sections 58.1-3229 through 58.1-3244 of the *Code of Virginia*). The purpose of the program is as follows:

- To encourage the preservation and proper use of such real estate in order to assure a readily available source of agricultural, horticultural, and forest products and of open spaces within the reach of concentrations of population,
- To conserve natural resources in forms which will prevent erosion and to protect adequate and safe water supplies,
- To preserve scenic natural beauty and open spaces,
- To promote proper land-use planning and the orderly development of real estate for the accommodation of an expanding population, and
- To promote a balanced economy and ameliorate pressures which force conversion of such real estate to more intensive uses and which are attributable in part to the assessment of such real estate at values incompatible with its use and preservation for agricultural, horticultural, forest or open space purposes.

The administration of property taxes in Virginia occurs on the local level. Local taxing units (counties, cities, and towns) with an adopted land use plan enact a local ordinance authorizing use-value taxation for agricultural, horticultural, forest and/or open space land (Commonwealth of Virginia, State Land Evaluation Advisory Council).

The State of Virginia uses the deferred tax approach in use-value assessment. Eligible land is assessed on both the basis of market-value and use-value. The difference between the market-value assessment and use-value assessment is the exemption provided by the deferred taxation program. The amount of tax actually paid is the amount assessed on the basis of use-value. The amount of tax still owed after the use-value tax is paid is the deferred tax. Deferred taxes serve as a lien on the land for a period not to exceed the six most recent tax years. However, should the landowner change the use of the land to a non-qualifying use or split off a parcel of the original eligible tract of land, the deferred tax plus annual simple interest becomes due and payable (Hady and Sibold). For agricultural, horticultural and forest lands, estimated average income from the land use is capitalized to determine the use-value. Gross income per acre less production costs are defined as net income. Net income is then divided by a predetermined capitalization rate to produce the use-value.

Use-value assessment has had mixed results as a deterrent to the conversion of agricultural and open space land. On the one hand, proponents of differential assessment assert that ad valorem taxation results in farmers supporting an unfair portion of the tax burden. It is argued that the farmer's income is small relative to the commercial (market) value of his property, therefore the farmer is unable to bear the higher tax burden (Barlowe, Ahl, and Bachman; Keene). In addition, it is believed that the farmer uses fewer governmental services in proportion to his property and that high property taxes force the premature selling of farm land. Thus, differential assessment provides a tax relief for farmers in order to improve their financial viability, increase tax fairness and to provide for orderly and directional development (Hady and Sibold; Keene). On the other hand, evidence suggests that the effect of the tax law on land use patterns is negligible and the decrease in the local property tax base may be significant (Stocker 1975; Stoll, et. al.). In addition, it is claimed that use-value subsidizes speculators. It has been suggested that when used without other land use controls, use-value assessment has been relatively inefficient in the long run. Perhaps this is due to the fact that policy makers have implemented one strategy to resolve two distinctly different objectives: relieving farmers of their increased tax burden (equity) and the preservation of open space (provision of a public good).

I.2 Purpose of the study

This study seeks to determine the fiscal impacts of alternative land uses and the impact of use-value taxation. It has been argued in the literature that use-value taxation does not succeed in retaining open space along the rural-urban fringe (Stocker 1975; Ferguson), and further that such programs may actually lower the community's property tax base significantly (Stoll, et. al.; Anderson 1993). Abeyratne and Johnson have shown that lower assessment of agricultural land must be offset by higher tax rates on residential and commercial property uses (as well as agricultural property). Their model suggests that lower tax rates on agricultural land reduce revenues. From the fiscal standpoint, a decline in revenues results in the reduction of available services, which makes the community less attractive.

In this study, a broader evaluation of the program in terms of fiscal impacts is sought: the focus of this study is on evaluating the balance between the impacts of use-value taxation on revenues (the current practice) versus their impacts on local government expenditures, in comparison to the fiscal impacts of a residential and commercial mixed use development. Previous studies (Ferguson and Anderson) have concluded that use-value taxation programs delay the development of agricultural land for the program enrollment period, along the rural-urban fringe. Further, agricultural land uses require (demand) fewer public services than do residential or commercial land uses (Abeyratne and Johnson). While revenues generated may be higher for particular land use, there may also be a corresponding higher demand for public services. The demand for increased public services results in increased expenditure outlay. Thus, by comparing the balance between the direct public costs incurred and immediate revenues generated by different land uses, due to the corresponding property tax rate, the effectiveness of land use taxation policies for communities can be determined.

In this study, the net fiscal impact of allowing a parcel of land currently enrolled in use-value assessment to be developed for mixed-use (residential and commercial) is estimated. This estimation is based on the annual direct impact (in 1992 dollars) of the mixed-use development after it is fully operational. This allows the treatment of the fiscal impacts estimated for 1992 as the potential annual fiscal impacts of allowing the parcel to be developed versus keeping it enrolled in use-value assessment. The objectives of the analysis is to a) compare the net expenditure impact of land development against the impact on property tax revenues, and b) to show the impacts of development of a chosen parcel of farm land on expenditures as well as revenues.

I.3 Method

Property taxation is of critical importance in the finances of localities. Real property taxes serve as the major source of revenue for local governments. It is the primary means by which the local government pays for the services it provides: police and fire protection, schools, roads, libraries, etc. The value of public services relative to their cost determines the willingness of property owners to pay higher taxes and the market-value of the real property itself (Abeyratne and Johnson).

Fiscal impact analysis measures the effects of economic change on local revenues and expenditures. This type of analysis projects the direct public costs and revenues associated with residential or nonresidential growth to the local jurisdictions in which this growth is taking place (Burchell and Listokin). Direct revenues include property taxes, other taxes and the intergovernmental transfers generated as a direct consequence of the particular growth alternative. Some expenditures include police, fire, public works and education services. Fiscal impact analyses provide measures of the net impact on local revenues and expenditures.

The "tax price" or "expenditure share" for each landowner is equal to the value of property owned by the landowner divided by the total value of privately held property (Ladd). Landowners' utility maximizing level of public service is based on each landowner's income, tax price and preferences for community provided services. A residential landowner may demand public services such as police and fire protection, library and parks. Whereas a commercial landowner may also demand police and fire protection but may consider public parking facilities and well maintained roads for easy access as equally important. Each land use contributes a different percentage to the community tax base given it's size, composition and requirements of public services.

I.4 Study Area

A region most noted for its suburban appeal to a large metropolitan area is Northern Virginia, adjacent to Washington, D.C. Loudoun, Stafford, Prince William, and Fauquier Counties are just a few of the dozen Virginia counties experiencing the pressures of expanding urban peripheries. Prince William County provides a good example of a county where farmland has been aggressively developed for residential, commercial and industrial use. Between the years of 1980 and 1990, the county population grew by 49% from 144,703 to 215,677 (County of Prince William). Population density for the 336 square mile county increased from 427 persons per square mile to 641 persons per square mile between 1980 and 1990. As reported in the *Virginia Statistical Abstract*, the local real property tax rate for the tax year 1991 was $1.36 per $100 of assessed real property. Total taxable value of land[2] was reported at $12,054,409,000. The average local property tax rate for the state was $0.90 per $100 of assessed real property. In comparison, the tax rate for the county in 1980 was $1.22 per $100 of assessed real property with total taxable value of land of $2,695,271,120. For 1985, the tax rate was $1.42 per $100 of assessed real property with a total taxable value of land of $4,108,100,550. In 1989, the tax rate was $1.29 per $100 of assessed real property with a total taxable value of land of $9,928,249,000. In addition, the county's commercial and industrial real estate tax base has improved substantially. As a percent of the total tax base, commercial and industrial

[2] Assessed value of land and improvements under use-value taxation and fair market-value of all other taxable real property. Assessed value of non-agricultural land is generally equal to market-value in Virginia counties.

real estate tax base has increased over 40% since 1985 (County of Prince William). In 1992, commercial and industrial real estate was 23.50% of taxable real property, a 6.5% increase over 1991 (County of Prince William). In this case study, Prince William County is used as the study area in examining the fiscal impact of alternative land uses and use-value taxation.

I.5 Outline of the Study

Chapter II will discuss previous studies which deal with the issue of use-value taxation and growth along the rural-urban fringe. This will be followed by a discussion of fiscal impact analysis and the model in Chapter III. A brief description of the study area will also be presented, along with the presentation of alternative development scenarios. Chapter IV will present the results of the fiscal impact analysis. The final chapter will summarize the results and conclude with possible avenues for further analysis in determining policies directed at land use alternatives and the preservation of open space.

II Impacts of Use-Value Taxation

This chapter provides a review of previous studies addressing the issue of use-value taxation. The literature suggests that use-value taxation programs do not curtail the development of farmland, though they may delay some development (Anderson; Barlowe, Ahl and Bachman; Ferguson; Fisher). Other studies have argued that when land is taxed by its use-value rather than market-value, the local tax base declines curtailing local public services, and consequently reducing the attractiveness of the community for residential, commercial and industrial land uses (Abeyratne and Johnson; Bickerdike; Netzer; Oates). Hence, the need for evaluating use-value taxation programs on the basis of fiscal impact is identified.

II.1 Background

> Americans seem by nature to be inclined to exaggerate the role that taxes play in decision making. Whatever we see happening around us we tend to blame on some feature of the tax system. And whenever we identify some policy objective, we look for ways of gimmicking our tax system to promote it. I think we greatly exaggerate the extent to which the spread of urban areas, the phenomenon of urban sprawl, strip development along rural roads, and scattered subdivision are caused by our property tax policies. And I think we exaggerate the extent to which property tax changes, such as assessing land at it's "use-value," can affect these phenomena (Stocker 1975, 26-27).

It has been argued that use-value assessment programs award benefits to a certain group of taxpayers without requiring any subsequent obligations (Stocker 1961; Barlowe, Ahl, Bachman). As was discussed in the introductory chapter, use-value assessment programs were designed to provide preferential tax treatment for farmers. These programs are intended as a means for preserving agricultural and open space areas and for the equitable taxation of farm owners in growing communities (Barlowe, Ahl, and Bachman). In their report on Use-Value Assessment Legislation in the United States, Barlowe, Ahl and Beckman identify the equity dilemma and further state that contracts such as these "encourage speculators and developers to acquire farm and other open space lands far in advance of the time when they will be needed for development . . . resulting in tenancy, less intensive land use, and the hedge-hopping of speculator held tracts in land development."

II.1.1 Capitalization of Land Rent

According to Stocker, "the influence of property taxes on land use decisions, whatever its nature, cannot be a major determinant . . . the conversion of farmland around a growing city is a result of good old American profit seeking (Stocker 1975, 27)." Given the economics of the land market, this conversion is what is to be expected. Land around growing cities becomes more profitable in uses other than farming. Profit-maximizing landowners base their decision of whether to sell by examining the relationship between the current expected rate of return on the land parcel and the highest expected rate of return on alternative investments. Stocker concludes that the similar rise in property assessment and taxes "is only a collateral *result* of the working competitive market forces, and not a *cause* of the changing patterns of land use (Stocker 1975, 27)." The implication is that, from the standpoint of the community and the demands for increased local government services, use-value assessment may result in the curtailment of local community services as the appreciating capital values of idle tracts are foregone.

Empirical evidence supports Stocker's position that property taxes have not played a significant role in determining whether private landowners decide to use their land for development (Owen and Thirsk, Davis and Sazama; Bahl; Mieszkowski). The model tested by Owen and Thirsk suggests that property taxation does not constitute an effective tool of land policy. Their model assumes that the property tax is completely capitalized so that the current owner will bear the full burden of the tax. According to their model, land will be developed by comparing after-tax rates of return on alternative investments. "When the property tax is fully capitalized into both current and future land prices, the effect of a higher tax rate is to impose an immediate capital loss on the landowner and to leave unchanged his rate of return on land holding (Owen and Thirsk 1974, 253)." This result is consistent with a study by Mieszkowski which states that property taxes are considered costs and hence landowners will subtract the property taxes when bidding for prospective sites. As Netzer points out, "location rents constitute a surplus, and taxing them does not reduce the supply of sites offered; instead, the site value tax will be entirely neutral with regard to landowner's decisions, since no possible response to the tax can improve the situation, assuming that landowners have been making maximum use of their sites prior to imposition of the tax (Netzer 1966, 204-205)." Netzer further states that "if the goal is the preservation of open spaces, then an unneutral property tax is a clumsy instrument indeed to guarantee this in the event of urbanization. It cannot assure that the appropriate types and locations of open space are preserved, only an entirely accidental selection (Netzer 1966, 207)."

II.1.2 Local Revenue Sources

Though the arguments above conclude that deferred property taxation does not play a significant role in determining land use patterns, it should be noted that these arguments only address property taxation from the point of view of the capitalization of land rent. However, property taxes are also means of paying for local public services. In fact, real property taxes serve as the major source of revenue for local governments. Wunderlich and Blackledge report that nationally "real property tax supplies two-thirds of local tax revenues and over 40 percent of all local revenue (2)." Across the Commonwealth of Virginia, property tax revenues comprise of 46 percent of total revenues, while for Virginia counties, the proportion was slightly higher at 49 percent (based on data reported in "Comparative Report of Local Government Revenues and Expenditures Year Ended Jun 30, 1990" published by the Auditor of Public Accounts of the Commonwealth of Virginia).

As pointed out earlier, different types of land use have differing demands for local public services. "The tax income from the various uses of land becomes highly significant when compared to the cost of municipal services (Wehrly and McKeever 1952, 12)." It has been suggested that use-value taxation delays the development of agricultural land over the enrollment period, thus generally slowing development (Anderson 1986, 1993; Blewett and Lane; Ferguson). Retaining agricultural land, or preventing development keeps down the demand for services which can lead to lower expenditures. Thus, use-value taxation programs potentially effect both the revenues and expenditures of the locality. Therefore, these programs must be evaluated in terms of their net fiscal impact on the community.

Growth along the rural-urban fringe, suburbanization, has resulted in demand for greater public services. As populations increase, local communities must determine whether or not the increased revenues received from developments can cover the expenditures required for infrastructure improvements and services.

A study conducted by William E. Oates examines the effects of property taxes and of local public spending on property values. Oates uses the Tiebout Hypothesis of residential location to explain the relationships. Tiebout's (1956) model explores the relationship between public service consumer location and the preferences for local public services. According to Tiebout's model, consumers will move to that community which offers the best tax-expenditure program according to their tastes and preferences (Tiebout 1956, 418). From Tiebout's standpoint, the individual's tax liability (market-value of parcel multiplied by property tax rate) becomes the price of consuming the local output of public services. Oates states that the focus should be on "the present value of the future stream of benefits from the public services relative to the present value of future tax payments (Oates 1969, 959)." Hence, according to Oates, the outputs of public services should influence the attraction of a community to potential residents and should affect local property values. In growing suburban communities, evidence has shown that utility maximizing consumers will weigh the benefits received from local public services against the cost of their tax liability in selecting their place of residence (site value).

Oates extends Bickerdike's argument that "municipal services then should . . . be paid for by those for whose first-hand benefit, or on whose responsibility, they are provided, i.e., the whole body of inhabitants. . . . After all, when one asks why owners of property should be taxed, the answer must be because they benefit (Bickerdike 1959, 277, 382). " Bickerdike argues further that though land is traditionally valued for what it produces, on urban land "what is really 'produced' is a power to satisfy wants, a group of conveniences. . . . For practical purposes a tax levied in respect of any commodity must be regarded as falling upon consumers. If they shift any part by reducing their consumption they do not really escape the burden to the extent of their saving; they suffer loss of convenience (Bickerdike 1959, 284, 385)." In essence, property taxes may be viewed as a user charge . . . " - a revenue device for the support of particular services under which individuals' tax liabilities accord rather well with their consumption of the specific services (Netzer 1966, 59)." It should be noted that though property taxes can be viewed as a user charge, they do not pay for one particular service but rather a group of services.

Recent studies (Anderson, 1986, 1993; Blewett and Lane; Ferguson) examining the effectiveness of use-value programs suggest a connection between property taxation and land use. Anderson (1986, 1993), and Blewett and Lane, focus on the temporal aspect of differential assessment and urban development. Their studies conclude that differential assessment programs merely retard conversion rather than prevent it. As a delay mechanism, Anderson suggests that use-value assessment may be effective in areas along the rural-urban fringe but concedes that these areas will experience a rise in tax rates. Ferguson, also interested in the temporal dimension, examines the rates of land conversion after the implementations of use-value assessment. In his study, time-series analysis is applied to four Virginia counties; Fauquier, Loudoun, Prince William and Virginia Beach. Ferguson concludes, "Use-value taxation is not, by itself, enough to stem the conversion pressures. These counties [Fauquier, Loudoun, Prince William] are near the Washington, D.C., metropolitan area, where pressures for development are increasing as more and better roads in the area make commuting attractive (Ferguson 1988, 164-165)."

Delaying the development of land, has immediate fiscal implications as noted by Abeyratne and Johnson who examine the elasticity of tax rates and the resulting level of public services available, lower tax rates on agricultural land uses reduce revenues. Thus, Abeyratne and Johnson conclude that use-value taxation "reduces residential and commercial property values, reduces the fiscal strength of rural counties, and shifts the tax burden from agricultural land (Abeyratne and Johnson 1989, 7)."

The relationship between land use and property taxes is established in the effects of varying land uses on the local budget. Exploring the effects of land use on local revenues and expenditures may give some insight to how land use and property taxes relate. Each development alternative will have a different impact due to the revenues and expenditures the project generates. The direct revenues, property taxes, sales tax, user fees, licenses, etc., from a particular land use must pay for the services demanded. If the costs exceed the revenues generated, the local government may view the particular land use as fiscally harmful to the community as a whole, since the maintenance of current levels of service will require property tax rates to be raised.

II.2 Comparing the Fiscal Impact of Land Use Alternatives

The objective of this study is to simulate two different land use patterns for Prince William County, Virginia and examine the impacts of each alternative: an average farm enrolled in the use-value assessment program and a typical residential and commercial development, on the local economy. The impacts will be assessed using fiscal impact analysis. Fiscal impact analysis is often used in cases where the costs of land use decisions need to be determined. This method was chosen rather than cost-benefit analysis because the focus of this research is on net local public expenditure and revenue.

The focus of this study is on the fiscal impact of alternative land uses and property taxes hence, net local public expenditure and revenue. The development of the mixed-use scenario serves to evaluate use-value taxation against development alternatives. It is expected that this case study may be used in conjunction with other studies for determining effective land use taxation policies for communities along the rural-urban fringe. The following chapter discusses fiscal impact analysis in greater detail.

III Fiscal Impacts of Land Use Alternatives

The purpose of this study is on determining the local fiscal impact of alternative land uses. The impact of each development alternative on local revenues and expenditures is measured by fiscal impact analysis. This chapter presents the approach used to analyze the fiscal impact of alternative land uses: the method, assumptions, and data used in this study. An overview of the method of fiscal impact analysis in the first section is followed by a discussion of the econometric model including the parameters estimated. The use of the estimated equations to construct the fiscal impact model is then discussed. The study area and alternative land use scenarios are presented in the final section of the chapter.

III.1 Fiscal Impact Analysis

According to Burchell and Listokin, fiscal impact analysis is often used interchangeably with cost-revenue analysis. However, fiscal impact analysis comprises only a part of cost-revenue analysis. Cost-revenue analysis compares tangible as well as intangible costs and revenues (Burchell and Listokin), while fiscal impact analysis is only concerned with public fiscal costs and revenues. Another method, the broadest of the three, is cost-benefit analysis. In addition to public expenditures and revenues, cost-benefit analysis estimates impacts on individuals, the community, and/or the environment (Burchell and Listokin). Similar to cost-revenue analysis, it estimates the monetary value of impacts. Cost-benefit analysis estimates the value of impacts using the willingness to pay criterion as the basis for measuring both increases and decreases in consumer utility. Cost-revenue analysis measures only the costs and revenues associated with a specific type of growth. This method determines the difference between the cost of providing municipal services required by a development and the expected municipal income it generates. As a subset of cost-revenue analysis, fiscal impact analysis considers only the net local costs and revenues resulting from a project or policy (Burchell and Listokin).

Canter, Atkinson, and Leistritz define the purpose of a fiscal impact analysis as

> . . . to determine whether project-induced changes will generate enough taxes and revenues to pay for the added public services and required expenditures. Many local governments interested in ascertaining the impacts of major projects on the local community prior to their development use fiscal impact assessments to aide in the decision-making process (Canter, Atkinson, and Leistritz 1985, 211).

Assessing the fiscal impacts of a proposed project involves making predictions about the future with and without the proposed project, and determining the significance of the project-induced impacts (Canter, Atkinson, and Leistritz).

Fiscal impact analysis seeks to measure direct public costs incurred and immediate revenues generated by a particular land use project (secondary costs are difficult to measure and often result in double counting). It focuses on increases in population and/or employment as a determinant of growth in public revenues and expenditures. This population and/or employment change is broadly defined by the entrance or departure of residential and/or nonresidential facilities in a community. This method estimates the direct impacts of a given land development or strategy, considering the current costs and revenues the project would generate if it were completed and operating today. It is important to recognize that this type of analysis only accounts for local impacts.

Focusing on local costs discloses potential change in local expenditures. Local constituents are extremely interested in the magnitude and use of local tax revenues. The ultimate result of this analysis is a comparison of the total expenditures and revenues associated with a project over a given period in order to estimate whether it will generate a fiscal surplus or deficit for the local government in comparison with alternatives..

The assumptions held in this analysis are 1) all communities differ with respect to service capacity, and 2) though current local service levels (baseline) may change somewhat, they represent the criteria against which local fiscal capacity are calculated (Keeling). The method of analysis used in this study is as follows. The results obtained from the simulation model are used to set up a method of calculating changes in expenditures and revenues based on changes in predetermined variables. The baseline is characterized by the levels of the predetermined variables in the secondary data. Each scenario describes the changes caused by alternative land uses. These changes are used to compute the values of the predetermined variables which would be obtained if the land use alternative were currently in place. Expenditures and revenues under the scenario are then calculated in turn. Finally, the net fiscal impact is calculated by comparing the fiscal surplus or deficit prevailing under the scenario for the given land use alternative(s).

III.2 Specification and Estimation of the Simulation Model

In order to estimate fiscal impacts, a model projecting revenues and expenditures based on conditions facing the locality must be estimated. The model estimated for this study is based on the data and estimation procedures used by Johnson and Keeling. Johnson and Keeling estimate expenditure and non-local aid equations in a simultaneous system, and individual equations for real and personal property tax bases, and for sales and other tax revenues per capita.

In this study, it is necessary to analyze the impact of changing the assessment rate of agricultural property to reflect its enrollment in the use-value taxation program versus non-enrollment. Thus, rather than use real property tax base as the argument in the expenditure and non-local aid equations as used in the model of Johnson and Keeling, the specification used in this study uses the market value of real property per capita, the proportion of total property in agriculture expressed as a percentage and the effective assessment rate of agricultural property also expressed as a percentage. This choice of explanatory variables is designed to capture differences across communities in the total market value of real property, and in the value of property exempt from taxation. Localities with identical market value of real property may have different proportions of real property in agriculture and different assessment rates for agricultural property, resulting in different abilities to raise revenues from real property. These differences may, in turn, significantly explain the differences in expenditure patterns across localities. The reasoning here is that as the effective assessment rate falls and/or the proportion of real property in agriculture rises, real property tax revenues generated fall for a given level of market value of real property. The lower tax revenues are interpreted as a lower ability to pay for services (Abeyratne and Johnson), and thus it is hypothesized that the parameters in the expenditure equations associated with the percentage of real property in agriculture will be negative, and those associated with market value of real property and the effective assessment rates of agricultural property will be positive. The parameters in the non-local aid equations are expected to have the opposite signs as above since, non-local aid generally declines as the ability to pay increases. However, Keeling argues that wealthier localities tend to have greater political clout, and are able to capture higher levels of non-local aid per capita.

Demographic equations model population, labor force, unemployment, enrollment, incommuting and outcommuting. The equations are designed to capture the effect of changes in employment, on unemployment, on commuting patterns, on laborforce, and in turn on population and employment. In the current study, equations previously estimated and used in the Virginia Impact Projection (VIP) Model of Johnson and Keeling are utilized. These variables affect the level of public service provision as discussed below.

III.2.1 Expenditures

Specified expenditure categories are: police, jails, courts, fire, welfare, health and mental health, recreation, development, public works, administration, and education. Per capita expenditures in each of these categories are hypothesized to be functions of demographic variables such as population, unemployment, and enrollment; economic conditions such as per capita income, retail sales per capita, real and personal property per capita and employment; the composition of the population by age, percentage non-white and percentage graduates; service conditions such as crimes per capita, proportion of real property in agriculture, effective assessment rate of agricultural property, teacher-pupil ratio, solved crimes per capita and ratio of volunteer to professional firemen; non-local aid for various services and some interdependence of expenditure levels. In general, improvements in economic conditions make affordable a higher level of services and hence signs of their coefficients are positive in the expenditure equations. Some public services are affected by the composition of the population; for example, higher unemployment, higher percentage of non-white population, and lower percentage of graduates require higher welfare expenditures. Increase in solved crimes per capita cause higher expenditures on police and fire, which in turn cause jail and court expenditures to increase to incarcerate and trying the individuals involved to court. Higher ratio of professional to volunteer firemen are attained by increasing fire expenditure per capita, and higher teacher-pupil ratio are attained by higher education expenditures. For a more detailed review of the theories of public expenditures and decision making in the provision of public goods, please see Keeling; the above description draws heavily on Keeling.

The proportion of real property in agriculture is seen to negatively affect public expenditures since agricultural property seems to require fewer public services than does land developed for other uses. Lastly, the effective assessment rate of agricultural land determines the ability to raise revenues from agricultural property: the higher assessment rate leads to greater revenues generated, all else being equal. Thus, expenditures can be argued to be positively correlated with the effective assessment rate of agricultural land. The specification of the empirical equations for the eleven categories of expenditures is given below. Signs in braces indicate the signs postulated for the parameter estimated.

(1) Police Expenditures Per Capita = *f*(solved crimes per capita {+}, per capita income {+}, incommuting per capita {+}, population, market value of all property[3] per capita {+}, effective assessment rate of agricultural property per capita {-}, crimes per capita {+}, and non-local aid to public safety per capita {+})

(2) Correction and Detention Expenditures Per Capita = *f*(solved crimes per capita {+}, per capita income {+}, crimes per capita {+}, percentage of non-white {+}, non-local aid to public safety per capita {+}, and effective assessment rate of agricultural property per capita {+})

(3) Court Expenditures Per Capita = *f*(solved crimes per capita {+}, police expenditures per capita {+}, correction and detention expenditures per capita {+}, non-local aid to courts per capita {+}, market value of all property per capita {+}, proportion of market value of agricultural property to total market value of all property per capita {-}, and effective assessment rate of agricultural property per capita {+})

(4) Fire Protection Expenditures = *f*(market value of all property per capita {+}, proportion of market value of agricultural property to total market value of all property per capita {-}, effective assessment rate of agricultural property per capita {+}, crimes per capita {+}, population {+}, and non-local aid to public services per capita {+})

[3]"Property" includes land, buildings and improvements

(5) Welfare Expenditures Per Capita = f(per capita income {+}, market value of all property per capita {+}, proportion of market value of agricultural property to total market value of all property per capita {-}, effective assessment rate of agricultural property per capita {+}, population {+}, and percentage of non-white {+})

(6) Health and Mental Health Expenditures Per Capita = f(market value of all property per capita {+}, proportion of market value of agricultural property to total market value of all property per capita {-}, effective assessment rate of agricultural property per capita {+}, population {+}, elder population per 100 {+}, and non-local aid to health and welfare per capita {+})

(7) Recreation Expenditures Per Capita = f(market value of all property per capita {+}, proportion of market value of agricultural property to total market value of all property per capita {-}, effective assessment rate of agricultural property per capita {+}, outcommuters per capita{-}, population {+}, and non-local aid to parks and recreation per capita {+})

(8) Development Expenditures Per Capita = f(market value of all property per capita {+}, proportion of market value of agricultural property to total market value of all property per capita {-}, effective assessment rate of agricultural property per capita{+}, number of businesses per capita{+}, and non-local aid to development per capita{+})

(9) Public Works Expenditures Per Capita = f(market value of all property per capita {+}, proportion of market value of agricultural property to total market value of all property per capita {-}, effective assessment rate of agricultural property per capita{+}, number of businesses per capita {+}, and non-local aid to public works per capita {+})

(10) Administration Expenditures Per Capita = f(market value of all property per capita {+}, proportion of market value of agricultural property to total market value of all property per capita {-}, effective assessment rate of agricultural property per capita {+}, per capita income {+}, population {+}, and non-local aid to administration per capita {+})

(11) Per Pupil Education Expenditures = f(market value of all property per capita {+}, proportion of market value of agricultural property to total market value of all property per capita {-}, effective assessment rate of agricultural property per capita {+}, per capita income {+}, enrollment {+}, percent change in

enrollment {+}, teacher-pupil ratio {+}, and non-local aid to education per capita {+})

III.2.2 Non-Local Aid

The non-local aid equation estimated specified as follows. Dummy variables are used in the non-local aid to public works equations for Arlington, Buchanan, and Henrico counties since the data indicate that these counties have large state aid, possibly related to highway maintenance operations in these counties.

(12) Non-Local Aid to Public Works Per Capita = *f*(market value of all property per capita {-}, proportion of market value of agricultural property to total market value of all property per capita {+}, and effective assessment rate of agricultural property{-}, per capita income {+}, and retail sales per capita {+}, dummy variables—Arlington, Buchanan, and Henrico counties)

(13) Non-Local Aid to Courts Per Capita = *f*(court expenditures per capita {+}, police expenditures per capita {-}, percent change in population {+}, market value of all property per capita {-}, proportion of market value of agricultural property per capita to total market value of all property per capita {+}, and effective assessment rate of agricultural property per capita per capita {-})

(14) Non-Local Aid to Public Safety Per Capita = *f*(population {+}, unemployment per capita {-}, public safety expenditures per capita {+}, market value of all property per capita {-}, proportion of market value of agricultural property per capita to total market value of all property per capita {+}, and effective assessment rate of agricultural property per capita per capita {-})

(15) Non-Local Aid to Administration Per Capita = *f*(administration expenditures per capita {+}, retail sales per capita {+}, market value of all property per capita {-}, proportion of market value of agricultural property per capita to total market value of all property per capita {+}, and effective assessment rate of agricultural property per capita per capita {-})

(16) Non-Local Aid to Recreation Per Capita = *f*(per capita income {+}, retail sales per capita {+}, market value of all property per capita {-}, proportion of market value of agricultural property per capita to total market value of all property per capita {+}, and effective assessment rate of agricultural property per capita per capita {-}, outcommuters per capita {-}, and population density {+})

(17) Non-Local Aid to Health and Welfare Per Capita = f(per capita income {+}, health and welfare expenditures per capita {+}, market value of all property per capita {-}, proportion of market value of agricultural property per capita to total market value of all property per capita {+}, and effective assessment rate of agricultural property per capita per capita {-})

(18) Non-Local Aid to Education Per Pupil = f(per capita income {+}, per pupil expenditure {+}, percent change in enrollment {+}, teacher-pupil ratio {+}, market value of all property per capita {-}, proportion of market value of agricultural property per capita to total market value of all property per capita {+}, and effective assessment rate of agricultural property per capita {-})

(19) Non-Local Aid to Development Per Capita = f(development expenditures per capita {+}, number of businesses per capita {+}, graduates per 100 population {+}, percent change in population {+}, market value of all property per capita {-}, proportion of market value of agricultural property per capita to total market value of all property per capita {+}, and effective assessment rate of agricultural property per capita {-})

(Identity) Public Safety Expenditures Per Capita ≡ police expenditures per capita + correction and detention expenditures per capita + fire protection per capita

III.2.3 Market Value of Real Property

(20) Market Value of Real Property = f(per capita income {+}, number of businesses per capita {+}, outcommuters per capita {+}, per pupil expenditures {+}, proportion of market value of agricultural property per capita to total market value of all property per capita {+}, and effective assessment rate of agricultural property per capita {-})

As discussed above, *market value* of real property per capita is modeled as a function of per capita income, businesses per capita, outcommuters per capita, and education expenditure per pupil. The per pupil expenditure equation is itself modeled as a function of market-value of real property along with other variables (See (20) above). Therefore, the market value of real property per capita equation is included in the system of simultaneous equations within which the education expenditures are estimated.

The per capita expenditure equations in the system include the market value of real property, the proportion of agricultural property, and the effective assessment rate of agricultural property. Since these three variables explain substantial differences in localities' ability to pay for providing local public services, they can be expected to explain some of the variation in expenditure levels across localities. Further, the fiscal impact of withdrawal (and development) of land enrolled in use-value assessment can be evaluated. The additional variables are calculated as follows:

(1) Market Value of Agricultural Property = Assessed Value of Agricultural Property + Exemptions

(2) Effective Assessment Rate of Agricultural Property = Assessed Value of Agricultural Property / Market Value of Agricultural Property

(3) Proportion of Agricultural Property Value in Total Real Property Value = Market Value of Agricultural Property / Market Value of All Real Property

(4) Projected Assessed Value of All Land, Buildings and Improvements = Projected Market Value of Total Real Property * [1 - (Proportion of Agricultural Property in Total Real Property) * (1 - the Effective Assessment Rate of Agricultural Property)]

(Note: assessed value of non-agricultural land is assumed equal to the market value of non-agricultural land).

The market value of property is influenced by economic conditions prevailing in the locality as well as the provision of services by the local government. Assessed value of real property is determined by the fair market value of property, the implementation of differential rates of assessment for land employed to different uses, and particular assessment rates imposed by the community for land in various uses. Thus, economic and fiscal indicators (variables) can be used to explain variations in the market value of real property (land, buildings, and improvements), and to project the market value of real property for given changes in the "explanatory" variables. The real property tax base is then obtained by 1) determining the values of non-agricultural and agricultural property in the county using the proportion of real property in agriculture 2) determining the use-value of agricultural property in the county using the effective assessment rate of agricultural property and 3) adding the use-value of agricultural property to the market value of non-agricultural property. It should be noted that non-agricultural property is assumed here to be assessed at full fair market values (see Commonwealth of Virginia, Department of Taxation, 1992 Annual Reports, Table 5.4). The proportion of real property in agriculture is computed from base year data for the baseline; for the scenario, it is recalculated using direct changes in market values of agricultural and non-agricultural property along with base year data, as the ratio of the assessed value of agricultural property to its market value. The effective assessment rate of agricultural property is assumed to be fixed since the implementing ordinance for the use-value taxation program specifies the use-value assessment rate (Manual of the State Land Evaluation Advisory Council, Classification, Assessment and Taxation According to Use of Real Estate Devoted to Agricultural, Horticultural, Forest and Open Space Purposes). Finally, the fair market value of agricultural property in the base year is calculated as the sum of the assessed value of agricultural property in the base year and total enrollments in the base year.

The choice of explanatory variables in the structural equation for market value of real property is an empirical one. It has been observed that places with high per capita incomes and number of business per capita tend to have higher property values (Keeling). This is in large part due to the higher ability to pay afforded by higher incomes and higher levels of economic activity. Places with high per pupil expenditures tend to have higher property values because good schools add to the value of property in the school district. Keeling found that places with high outcommuters per capita tend to have higher property values; he argues that persons who commute to work own a greater amount of real property than those who do not commute.

It is important to note that since the proportion of agricultural property value in total market-value of all property is assumed to be predetermined, this model is not applicable in studying the fiscal impacts of policies/development which affect land values indirectly. Thus, the effect of developing a particular parcel of land can be analyzed as long as the development does not affect the market-value of (agricultural and non-agricultural) property in surrounding parcels. In other words, the model is applicable to marginal changes.

III.2.4 Other Revenues

(21)[4] Personal Property Tax Base = *f*(per capita income {+}, outcommuters per capita {+}, and per capita income squared {+})

---

[4]Equations remain unmodified

(22)[4] Sales Tax Revenue Per Capita = f(per capita income {+}, number of business per capita {+}, and incommuters per capita {+})

(23)[4] Other Tax Revenue = f(per capita income {+}, and sales per capita {+})

III.2.5 Parameter Estimation

The expenditure and revenue coefficients used in the Virginia Impact Projection (VIP) Model are estimated for the simultaneous model equations for Virginia counties. Projection equations under *Other Revenues* above are obtained from the VIP Model without re-estimation. The simultaneous equation model is estimated using the Three Stage Least Squares (3SLS) method. Three-stage least squares entails the application of generalized least-squares estimation to the simultaneous system of equations.

Pindyck and Rubinfeld describe the procedure as follows: in the first stage, the reduced form parameters of the system are estimated. This expresses the dependent variables in terms of predetermined or exogenous variables only. Next, the fitted values of the endogenous variables are used to generate 2SLS estimates of the structural equations in the system. Using the calculated 2SLS parameters, the residuals of each equation are used to estimate the cross-equation variances and covariances. In the third stage of estimation, the generalized least-squares structural parameter estimates are generated.

Data for the endogenous expenditure and revenue variables specified in this system of equations were obtained from the Auditors of Public Accounts, Comparative Report of Local Government Revenues and Expenditures, Department of Taxation Annual Report, Virginia Statistical Abstract 1992-1993 and 1994-1995 editions, Crime in Virginia: 1992, and Commuting Patterns of Virginia Workers: County and City Levels for 1990. As mentioned earlier the expenditure, non-local aid and market value of real property equations are estimated as part of the system. In the first run of estimations the equations specified above are estimated. Since the purpose of the estimations was simulation rather than hypothesis testing, only variables with t-ratio less than one were dropped. The estimations were re-run with the variable that had t-ratios of one or greater in the structural equations in the first round of the 3SLS estimation. Reduced form estimates were derived from the second round estimation of structural parameters and were used to build the fiscal impact model. The structural and reduced form parameters are shown in the appendix. The actual and predicted levels for expenditure and revenue variables under current circumstances are found in Table 1.

III.3 Fiscal Impact Model

The fiscal impact model is set up so that values of the predetermined (exogenous) variables can be stored. Using these stored values and the parameters estimated in the econometric model, formulae are set up to project the values of the endogenous variables. The assessment of fiscal impact is based on direct changes in employment, per capita income, property values (agricultural or non-agricultural property), and retail sales. Exogenous changes in population can also be entered into the model to derive fiscal impacts. These changes are added to the levels under the baseline to get the levels of the exogenous variables and, in turn, the revenues and expenditures (endogenous variables) under the "scenario." Differences between revenues and expenditures under the baseline and under the scenario are calculated, allowing the analysis of the relative effect of land use alternatives on revenues and expenditures, and of the net fiscal impact.

Equations relating changes in employment to unemployment, laborforce, and commuting patterns are used from the VIP Model, as is the relationship between laborforce and population. For this study, a static (one-period) fiscal impact model is used. This allows the results of the fiscal impact analysis to be interpreted as long-term annual impacts, given appropriate construction of the scenario. In order to allow this interpretation of impacts, scenarios are set up to reflect long-run permanent changes in various economic and demographic conditions.

III.4 Study Area and Scenarios

Knowledge of existing conditions identifies factors which encourage, as well as hinder, growth. Factors such as population, property values, and tax rates provides vital information concerning the pattern of local government revenues and expenditures.

III.4.1 Study Area

Prince William County, Virginia is located approximately 35 miles southwest of Washington, D.C. Bounded by Fairfax and Loudoun counties in the north, Fauquier County in the west, Stafford County in the south and the Potomac River in the east, Prince William County is part of the Northern Virginia Planning District and the Washington, D.C. Metropolitan Statistical Area. The County contains four incorporated towns and encompasses 11 Census Designated Places[5]. Within its boundaries are the independent cities of Manassas and Manassas Park.

According to the 1990 Census, Prince William County is the third most populous county in Virginia. The County grew by 57% between 1980 and 1992 from 144,703 to 226,806, an average annual increase of 3.7%. Latest estimates indicate an estimated population of 231,537 as of July 1993 (County of Prince William). Census Bureau data indicate that the median household income for Prince William County is higher than the median for the Commonwealth of Virginia: the median household income in the county was $49,370, while for the commonwealth of Virginia, median household income was $33,328. Median income has almost doubled since the 1980 census when median household income was $25,435.

Retail development and sales have increased with income growth. Since 1981 retail sales have grown from $47.1 million to about $1.6 billion. The major growth areas are along interstates I-95 and I-66. Here a concentration of high technology firms such as electronic, computer, commercial, telecommunications, engineering and technology corporations can be found (County of Prince William). Prince William continues to grow and change its economic base. The commercial and industrial real estate tax base has improved in the past several years. As a percent of the total tax base, the commercial and industrial real estate tax base has increased over 40 percent since 1985. The acreage of

---

[5]Census Designated Places (CDP's) are defined by the Census Bureau as densely settled population centers with a definite residential nucleus, a population density of at least 1,000 persons per square mile, but without legally defined corporate limits.

farm land from 1982 to 1987 declined by 27.7 percent (aggregate acreage in agriculture was 51,182 for 1982). In 1987 the average value of farm land per acre was $3,085. The acreage of farm land from 1987 to 1992 declined by 10.8 percent (aggregate acreage in agriculture in 1992 was 32,973). The average value of farm land per acre in 1992 was $4,593, with an average farm size of 127 acres.

III.4.2 Scenarios

The objective of this study is to compare the economic circumstances with and without an economic change under analysis. The objective of scenario building is to compare the economic circumstances with and without the economic changes or shock under study (Johnson and Keeling). The "without" case is the baseline, the case in which the local economy proceeds in a predicted manner with no unusual changes in conditions or growth rates. The "with" case incorporates changes related to any change in economic circumstance and are added to the baseline changes. A scenario introduces the direct effects of the economic changes in question to the model. The new revenue and expenditure patterns are compared with those simulated in the baseline to determine the impact of the project.

Baseline

The model is "baselined" given current conditions and growth rates. This step involves the introduction of data on the jurisdiction's socioeconomic conditions for the base year

1992 and assumed conditions for the baseline period. Data on trends and conditions discussed in the previous section are used to set up the baseline projections for the model. Data entered include demographic indicators and indicators related to education, public safety, public health, revenues and expenditure along with growth rates for income, employment and population. The data are obtained from Auditors of Public Accounts, Comparative Report of Local Government Revenues and Expenditures, Department of Taxation Annual Report, Virginia Statistical Abstract 1992-1993 and 1994-1995 editions, Crime in Virginia: 1992, and Commuting Patterns of Virginia Workers: County and City Levels for 1990. The baseline is compared to the scenarios to measure the net fiscal impacts.

The baseline projections are obtained using base year data for the exogenous variables, and the revenue and expenditure equations estimated for Virginia counties. In this case, the baseline includes land enrolled in the use-value assessment program. It is assumed that all eligible agricultural land is already enrolled in the program. Hence, the real property tax base is the market value of real property less the exemptions land owners are granted for enrolling the land as farm land/open space. For the fiscal year 1992, market and assessed values of land for Prince William County are summarized in Table 1. Total land area for the county was 332 square miles. Of this area, 32,973 acres (51.52 square miles) is reported as farmland. The percent of total property value in agriculture is 4.78, with a percent effective assessment rate of 25.31. Total assessed value of farm land and buildings is $151,100,082. The market value of farmland, $597,061,482, is calculated by adding the value of exemptions (market value of all land minus assessed value of all land) to the assessed value of farmland. Thus, by implementing the Use-Value Taxation program Prince William County rebates $6,377,248[6] in real property tax revenues.

Actual current values and predicted values under the baseline for expenditures and revenues are shown in Table 2. The predicted expenditure and non-local aid levels are products of the predicted expenditures per capita multiplied by population, except for education where predicted education expenditures per thousand pupils are multiplied by predicted enrollment to get predicted total education expenditures. Sales and other tax revenues are obtained by multiplying the per capita values by predicted population. Real and personal tax revenues are calculated by multiplying the predicted per capita tax base by population and then by the tax rate.

---

[6]Real Property Revenues Foregone = Total Exemptions multiplied by Real Property Tax Rate
= $445,961,400 * .0143

Table 1. Land Values for Prince William County, Fiscal Year 1992

Total Fair Market Value of All Land, Buildings & Improvements	$12,500,370,600
Total Taxable Value of All Land, Buildings & Improvements	$12,054,409,200
Total Exemptions	$445,961,400
Total Assessed Value of Farmland, Buildings & Improvements	$151,100,082
Exemption Rate of Farmland (%)	74.69
Market Value of Farmland, Buildings & Improvements	$597,061,482
Effective Assessment Rate of Farmland, Buildings & Improvements (%)	25.31
Percent of Total Property in Farmland	4.78

Table 2. Actual and Projected Expenditure and Revenue Levels

LEVELS	ACTUAL	BASELINE
Expenditures		
Public Works	$15,084,526	$7,265,626
Courts	$5,632,056	$2,774,137
Police	$24,122,789	$12,284,324
Administration	$15,793,958	$13,354,049
Parks & Recreation	$8,770,051	$6,523,129
Welfare	$13,636,133	$7,533,279
Education	$236,160,002	$172,187,482
Development	$6,467,802	$5,715,985
Correction and Detention	$10,624,055	$3,809,041
Health	$13,672,146	$15,873,894
Fire Protection	$17,080,841	$9,542,579
Revenues		
Tax Revenue:		
Real Property	$172,378,052	$172,373,056
Personal Property	$30,160,850	$21,484,736
Sales Tax	$16,085,297	$6,480,080
Other Tax	$78,207,124	$64,182,331
Non-Local Aid:		
NL Aid Public Works	$14,637	$17,299
NL Aid Courts	$1,790,132	$1,333,805
NL Aid Public Safety	$5,238,934	$3,976,276
NL Aid Administration	$766,445	$403,626
NL Aid Parks & Recreation	$391,951	$120,370
NL Aid Welfare	$11,746,043	$4,136,668
NL Aid Education	$102,944,251	$55,782,935
NL Aid Development	$351,395	$172,286

Scenario I: Mixed-Use Development

This scenario examines the fiscal impacts of developing a parcel of land currently enrolled as farmland to mixed-use. Mixed use will be defined here as part residential and part commercial. This type of development was chosen in order to capture increasing population demands on housing due to increased employment in the area. A proposed development was chosen to ensure that the scenario is accurate in specifying the direct impacts of development. In addition, this example is consistent with the type of projects allowed by the master plan, zoning ordinance and site plan ordinance of the county.

Direct changes caused by a potential mixed-use development are changes in the property tax base, in employment, in personal income, and in retail sales. Data on these changes, potential area developments, were obtained from the Prince William County Office of the County Executive.

Table 3 shows the direct changes associated with the mixed-use scenario developed for this study. This scenario is based on a proposal filed with the Prince William County Office of County Executive. The proposal entailed the development of residential, commercial, and recreation facilities on a 323 acre tract of land. Commercial development includes 3,820,000 gross square feet of office space, 200,000 gross square feet of retail, 300,000 gross square feet of hotel, and 45,000 gross square feet of conference center development. The residential development includes construction of 248 multi-family/townhouse units, 697 multi-family apartment units, and 600 elderly housing units. The recreation facilities include a 550 slip marina. Construction commenced in 1989 and

Table 3. Direct Changes Due to Mixed-Use Development

Population	3,554
Employment	13,500
Market Value of Non-Agricultural Land	$348,616,421
Market Value of Agricultural Land	-$5,848,751
Personal Property	$15,921,958
Retail Sales	$33,851,369
Personal Income	$223,158,792

proceeds until completion in 2010. While net fiscal impacts during the construction phase may not be insignificant, these are short-term impacts, whereas the purpose of this study is to compare the impacts of maintaining open spaces versus allowing farmland to be developed. Thus, it is argued that the focus should be on long term impacts. Direct changes in population, employment, property values, on-site retail sales and personal income were estimated in the proposal for each year during the development period.

The scenario development and analysis focuses on the long-run annual impacts of developing the land versus leaving it enrolled in use-value assessment. Thus the scenario reflects *net* additions to population, employment, property, retail sales, and personal income due directly to the development. These are calculated as total levels prevalent at the end of the study period, as reported in the development proposal. All dollar amounts have been converted to 1992 dollars using the discount rate of 7.5%, the "effective cost of funds" to Prince William County.

For the purpose of analysis, it was assumed that land currently enrolled in use-value taxation is rezoned, thus reverting to full market-value assessment, and then gains further in value as it is developed. Reduction in agricultural property value is the size of the parcel in acres times the market value of agricultural land per acre in the base year, $18,107. Thus, agricultural land in the county is reduced by 323 acres, by $5,848,751 in 1992 dollars.

Scenario II: Reduction of Agricultural Property Enrolled in Program

In this scenario, ten percent of the value of real property in agriculture is assumed to be moved from use-value assessment to full market value assessment. The total market value of real property remains unchanged. The purpose of this study is to contrast the impacts to revenues and expenditures of merely removing land from enrollment, as opposed to the earlier scenario where it is assumed to be enrolled until ready to be developed. The previous scenario thus looks at removing land from use-value assessment and it being developed soon after. Ten percent of agricultural property in Prince William County is $59,706,148. It is assumed that the market value of agricultural property capitalizes the previous five years of tax liability that comes due upon withdrawing agricultural property from use-value taxation.

The following chapter presents a discussion of the analysis conducted using the fiscal impact model. Impacts on revenues and expenditures and net fiscal impact are discussed. The implications of these results for communities adopting use-value taxation are suggested.

IV Analysis

The fiscal impact model whose construction was discussed in the previous chapter was used to measure the net fiscal impacts of use-value assessment. Two scenarios are used to represent various possible land-use alternatives to continuing enrollment of existing agricultural property. In the first scenario, it is assumed that a particular parcel of land is withdrawn from use-value assessment and developed to residential and commercial use. In the second scenario, it was assumed that ten percent of agricultural property in Prince William County is withdrawn from use-value assessment, but is held undeveloped. The results of the fiscal impact analysis are discussed in this chapter.

IV.1 Fiscal Impacts

IV.1.1 Scenario I: Mixed-Use Development

The results obtained from the fiscal impact analysis for the mixed-use scenario are shown in Tables 4 and 5 below. Table 4 is a summary of revenue and expenditure impacts shown in Table 5, and includes the net fiscal impact for the scenario.

Under the mixed-use scenario, property tax revenues increase by approximately 19 million dollars, while total revenues increase by approximately 22 million dollars. Total expenditures increase by 15 million dollars, resulting in a net fiscal impact of approximately 7.1 million dollars. The projected net fiscal impact of the mixed-use

Table 4. Net Fiscal Impact of Mixed-Use Development

SUMMARY	BASELINE	MIXED-USE SCENARIO
Total Expenditures	$302,609,817	$325,735,680
Total Non-Local Aid	$63,809,280	$60,985,100
Sales Tax Revenues	$6,480,080	$6,706,422
Other Tax Revenues	$64,182,331	$70,104,251
Real Property Tax Rate	.0143	.0143
Personal Property Tax Rate	.0361	.0361
Property Tax Revenues	$225,658,710	$250,091,890
Total Revenues	$360,130,400	$387,887,663
Revenues Net of Expenditures	$57,520,584	$62,151,983
NET FISCAL IMPACT		$4,631,399
Change in Property Tax Revenue		$24,433,181

development is thus less than half the projected impact on property tax revenues. Focusing solely on the impact on (property tax) revenues, and disregarding impacts on expenditures, could lead to an exaggerated assessment of the mixed-use development to the county's finances. The analysis serves to highlight the fact that, while allowing land enrolled in use-value assessment to be developed does indeed increase revenues, it also precipitates a need for the provision of additional services.

Total direct employment change, as shown in Table 3 in the previous chapter, was 13,500 net increase. The labor force and commuting equations taken from the Virginia Impact Projection (VIP) Model (Johnson and Keeling) predict that of this number the vast

Table 5. Projected Expenditure and Revenue Levels for Mixed-Use Development

LEVELS	BASELINE	MIXED-USE SCENARIO
Expenditures		
Public Works	$7,265,626	$7,504,243
Courts	$2,774,137	$2,900,010
Police	$12,284,324	$13,250,144
Administration	$13,354,049	$14,591,626
Parks & Recreation	$6,523,129	$7,345,125
Welfare	$7,533,279	$7,865,305
Education	$172,187,482	$178,273,325
Development	$5,715,985	$6,392,129
Correction and Detention	$3,809,041	$4,251,625
Health	$15,873,894	$16,395,399
Fire Protection	$9,542,579	$10,231,425
Revenues Tax Revenue:		
Real Property	$172,373,056	$190,306,226
Personal Property	$21,484,736	$22,674,457
Sales Tax	$6,480,080	$6,706,422
Other Tax	$64,182,331	$70,104,251
Non-Local Aid:		
NL Aid Public Works	$17,299	$17,485
NL Aid Courts	$1,333,805	$1,335,249
NL Aid Public Safety	$3,976,276	$4,157,999
NL Aid Administration	$403,626	$484,704
NL Aid Parks & Recreation	$120,370	$117,048
NL Aid Welfare	$4,136,668	$4,014,705
NL Aid Education	$55,782,935	$52,927,522
NL Aid Development	$172,286	$177,569

majority, 8,298, will be taken by individuals residing outside Prince William County and commuting to the county. The model also predicts that 590 residents of Prince William County that previously commuted to work elsewhere will find employment within the county. The labor force is projected to increase by 1,238 while unemployment goes down by 3,375. Finally, as a result of the increase in labor force, population is projected to increase by 2,256. Enrollment is projected to increase by 458 pupils.

The size of the parcel considered in this scenario, 323 acres, is roughly 3 times the average farm size of 127 acres in Prince William County in 1992 (Center for Public Service). It should be pointed out that the mixed-use development proposal used to develop this scenario is fairly ambitious, and thus leads to fairly large increase in population, income, employment, and retail sales. The impacts would be smaller if a) a larger proportion of the housing developed were occupied by current residents of Prince William County, b) if the development proposal were more modest, i.e. did not entail large building and improvements to the land, and/or c) if the commercial development did not lead to as large an increase in retail sales and personal income. This scenario can thus be seen as an "optimistic" case.

Property tax revenues increase following the higher property values caused directly by the mixed-use development of the parcel. Sales tax revenues increase due to the direct increase in retail sales, population and income, as do other tax revenues. The model predicts that non-local aid decreases with higher property values and higher incomes.

Since expenditures are positively related to employment, per capita income and population, all of which increase, expenditures increase.

IV.1.2 Scenario II: Ten Percent Reduction in Agricultural Land Enrolled under Use-value Assessment

In this scenario, the only change introduced is to withdraw 58 million dollars in agricultural property from the use-value assessment program. In effect, this lowers the proportion of real property in agricultural assessment in the county.

Tables 6 and 7 report the results obtained from the fiscal impact analysis for the current scenario. Property tax revenues increase by 318 thousand dollars, while total revenues increase by 349 thousand dollars due to the higher assessment of the land withdrawn from use-value taxation. The model predicts that non-local aid increase by approximately 30 thousand dollars under this scenario since counties with a higher proportion of property in non-agricultural uses have higher levels of non-local aid. Total expenditures decrease by 197 thousand dollars, resulting in a net fiscal impact of approximately 546 thousand dollars.

Table 6. Net Fiscal Impact of Removing 10% of Agricultural Property from Use-Value Assessment

SUMMARY	BASELINE	10% REDUCTION SCENARIO
Total Expenditures	$256,863,526	$256,666,352
Total Non-Local Aid	$65,943,266	$65,973,767
Sales Tax Revenues	$6,480,080	$6,480,080
Other Tax Revenues	$64,182,331	$64,182,331
Real Property Tax Rate	.0143	.0143
Personal Property Tax Rate	.0361	.0361
Property Tax Revenues	$193,857,792	$194,176,086
Total Revenues	$330,463,469	$330,812,265
Revenues Net of Expenditures	$73,599,943	$74,145,913
NET FISCAL IMPACT		$545,970
Change in Property Tax Revenue		$318,294

As proportion of market value of agricultural property per capita to total market value of all property per capita falls, expenditures decline. On the other hand, proportion of market value of agricultural property per capita to total market value of all property per capita is negatively related to non-local aid. Therefore as proportion of market value of agricultural property per capita to total market value of all property per capita falls, non-local aid increases. Exemptions fall when there is a reduction in enrollment in the program, so the property tax base and property tax revenues rise. Moreover, since

Table 7. Projected Expenditure and Revenue Levels for 10 Percent Reduction in Agricultural Property Enrolled under Use-value Assessment

LEVELS	BASELINE	10% REDUCTION SCENARIO
Expenditures		
Public Works	$7,265,626	$7,307,972
Courts	$2,774,137	$2,778,055
Police	$12,284,324	$12,278,822
Administration	$13,354,049	$13,356,157
Parks & Recreation	$6,523,129	$6,528,649
Welfare	$7,533,279	$7,515,382
Education	$172,187,482	$172,018,140
Development	$5,715,985	$5,716,329
Correction and Detention	$3,809,041	$3,796,998
Health	$15,873,894	$,15,818,465
Fire Protection	$9,542,579	$9,551,383
Revenues Tax Revenue:		
Real Property	$172,373,056	$172,691,350
Personal Property	$21,484,736	$21,484,736
Sales Tax	$6,480,080	$6,480,080
Other Tax	$64,182,331	$64,182,331
Non-Local Aid:		
NL Aid Public Works	$17,299	$16,376
NL Aid Courts	$1,333,805	$1,332,194
NL Aid Public Safety	$3,976,276	$3,955,999
NL Aid Administration	$403,626	$394,397
NL Aid Parks & Recreation	$120,370	$119,293
NL Aid Welfare	$4,136,668	$4,117,133
NL Aid Education	$55,782,935	$55,866,035
NL Aid Development	$172,286	$172,340

expenditures fall and non-local aid increases under the scenario, the fiscal impact is larger than the increase in property tax revenues relative to the baseline.

IV.2 Summary

The fiscal impacts of two land-use alternatives were compared to the baseline. Assuming that all agricultural land in the county is currently enrolled in use value taxation, the fiscal impacts of the alternatives can be considered to be indicators of the fiscal costs and benefits foregone by Prince William County in continuing to implement the use value taxation program. Further, by analyzing the fiscal impacts of scenarios which depict long-term changes induced by the land use alternatives studied, the results can be interpreted as annual fiscal impacts.

It was found that a large mixed-use development, involving residential, retail, and recreational facilities, would cause a large increase in employment, population, per-capita income, retail sales, and property values. These changes would, in turn, lead to significant increases in revenues from property taxes, and the local share of sales taxes. However, since such a development would also lead to increases in demand for public services, and since increases in property values generally lead to decline in -local aid, the net fiscal benefit (increased revenues less increased costs) to the county is smaller than the increase in property tax revenues alone.

When land is removed from use value assessment, but not developed, the only change is in the proportion of land in agriculture. This possibility was examined for a 10%

reduction in the amount (in dollar market value) of land enrolled in use-value assessment. It was found that since employment and per-capita income do not increase, and since expenditures are positively related with the proportion of land in agriculture, expenditures decline under this scenario. However, since less property is exempt from taxation, property tax revenues increase. Non-local aid, on the other hand, increases as land is removed from use-value assessment, due to increases in non-local aid to education. Thus, the net fiscal impact is greater than the increase in property tax revenues alone would indicate.

In summary, it can be said that as land is drawn out of agriculture, localities enjoy overall fiscal benefits; some of the increase may be offset by increasing service demands if development brings new population or causes large improvements in real property, employment, population, personal income, or retail sales. The following chapter presents some concluding remarks and offers some suggestions for further research in determining policies directed at land use alternatives and the preservation of open space.

V Conclusions

Use-value taxation programs have been established to provide tax subsidies as a means to preserve open space and deter the conversion of agricultural land. However, along the rural-urban fringe, the pattern of land development suggests that the program may not be achieving its objectives. Previous studies have shown that the program just affects the timing of development rather than deterring conversion. Proponents argue that the program provides tax relief for farmers in order to improve their financial viability and to provide for orderly and directional development (Hady & Sibold, Keene). Opponents argue that the effect of the tax law on land use patterns is negligible and the effect on the local property tax base may be significant (Stocker 1975; Stoll, et.al.).

If the program does effect the tax base then, from the standpoint of the locality, concern will be focused on the fiscal effects of the program. Thus, the fiscal impacts of such a program are important in evaluating the program. From the fiscal perspective, a decline in revenues may require a reduction of available services. In the case of growing communities, this would make the community less attractive to both existing and potential residents (Abeyratne and Johnson).

This study evaluated the balance between the impacts of use-value taxation on revenue sources versus their impacts on expenditures, in comparison to the fiscal impacts of alternative land uses: in other words, the net fiscal impact of allowing a parcel of land to be developed versus keeping it enrolled in the use-value taxation program. While the Use-value Taxation Program does cause the locality's fiscal "bottom line" to be adversely affected, it should be noted that total revenue losses may be offset by avoided expenditures. Thus, considering only the revenue impacts of use-value taxation programs neglects the fact that residential and commercial development might lead to increased demands for public services which, in turn, necessitates increased local public expenditures. The increase in expenditures is an impact which must also be considered. Further, when combined with non-fiscal benefits, it may be that the community would be willing to incur the net fiscal cost.

It seems that the use-value taxation program attempts to solve two distinctly different land use objectives. When the program is solely used as a form of land use control, it is relatively ineffective in the long run. Hence, other land use control strategies should be considered in conjunction with the use-value taxation program. Some possibilities include stricter growth management plans, zoning ordinances, and the purchase of development rights.

For the objective of preserving open space, growing communities might adopt a growth management plan which concentrates development near existing settlement where the provision of services is less expensive. In addition, the extent of leapfrogging or sprawl can be resisted by more stringent local review of subdivisions, increasing zoning ordinances and public investment on roadways, water, and other growth infrastructure to reinforce desirable patterns of development. In the interest of preserving agricultural land, localities can adopt a program to purchase development rights. This program would allow landowners to sell their development rights in exchange for legal agreements that keep their tracts permanently available for food and fiber production (Mulligan).

Two directions for further research are suggested by this thesis: one toward improving measurement of the fiscal impacts of use-value taxation programs, and the other to examine the effectiveness of alternative policies aimed at maintaining open space. It was noted earlier that due to the treatment of agricultural property as comprising a predetermined proportion of all property, the scope of analysis permitted by the model developed in this study was limited. Directly modeling property values in industrial, commercial, residential, and agricultural uses would permit the proportion of land in agriculture to be endogenously determined. Such a model would permit the analyst to examine the effect of totally abolishing the use-value taxation program, for example. Future research might also examine the effectiveness of the above mentioned land use policies used in conjunction with the use-value taxation program as a means to achieve both the preservation of open space and reduction of the tax burden for agricultural landowners.

References

Abeyratne, Frederick and Thomas G. Johnson. "Use Value Taxation and the Impact of Tax Rate Change on the Value of Agricultural Real Property Tax Base." Photocopy. Department of Agricultural Economics, Virginia Polytechnic Institute and State University, 1989.

Anderson, John E. "Property Taxes and the Timing of Urban Land Development." *Regional Science and Urban Economics* 16 (1986): 483-492.

Anderson, John E. "Use-Value Property Tax Assessment: Effects on Land Development." *Land Economics* 69, no. 3 (1993): 263-269.

Bahl, Ray W. "A Land Speculation Model: The Role of the Property Tax as a Constraint to Urban Sprawl." *Journal of Regional Science* 8, no. 2 (1968): 199-208.

Barlowe, Raleigh, James G. Ahl and Gordon Bachman. 1973. "Use-Value Assessment Legislation in the United States." *Land Economics* 49, no.2 (1973): 206-212.

Bickerdike, C.F. "Taxation of Site Values." In *Readings in the Economics of Taxation*. Homewood, Illinois: Richard D. Irwin, Inc., 1959.

Blewett, Robert A. and Julia I. Lane. "Development Rights and the Differential Assessment of Agricultural Land: Fractional Valuation of Farmland is Ineffective for Preserving Open Space and Subsidizes Speculation." *American Journal of Economics and Sociology* 47, no. 2 (1988): 195-205.

Burchell, Robert W. and David Listokin. *The Fiscal Impact Handbook*. New Brunswick, New Jersey: The Center for Urban Policy Research, 1978.

Canter, Larry W., Samuel F. Atkinson, and F. Larry Leistritz. *Impact of Growth: A Guide for Socio-Economic Impact Assessment and Planning*. Chelsea, Michigan: Lewis Publishers, Inc., 1985.

Center for Public Service. *Virginia Statistical Abstract 1992-1993 Edition*. Charlottesville, Virginia: The Rector and Visitors of the University of Virginia, 1992.

Center for Public Service. *Virginia Statistical Abstract 1994-1995 Edition.* Charlottesville, Virginia: The Rector and Visitors of the University of Virginia, 1994.

Clawson, Marion. "Urban Sprawl and Speculation in Suburban Land." *Land Economics* 38, no.2 (1962): 99-111.

Commonwealth of Virginia. *Manual of the State Land Evaluation Advisory Council: Classification, Assessment, and Taxation According to Use of Real Estate Devoted to Agricultural, Horticultural, Forest, and Open Space Purposes.* Richmond, Virginia: State Land Evaluation Advisory Council, 1988.

Commonwealth of Virginia, Auditor of Public Accounts. *Comparative Report of Local Government Revenues and Expenditures Year Ended June 30, 1990.* Richmond, Virginia: Auditor of Public Accounts, 1991.

Commonwealth of Virginia, Department of Taxation. *Annual Report 1990/1991.* Richmond, Virginia: Virginia Department of Taxation, 1992.

Commonwealth of Virginia, Superintendent of State Police. *Crime in Virginia: 1992.* Richmond, Virginia: Department of State Police, Uniform Crime Reporting Section, 1992.

Commonwealth of Virginia, Virginia Employment Commission. *Commuting Patterns of Virginia Workers: County and City Levels for 1990.* Richmond, Virginia: Virginia Employment Commission, Economic Information Services Division, State Data Center, 1993.

County of Prince William, Virginia. *Progress and Perspective.* Manassas, Virginia: Office of Economic Development and Conference & Visitors Bureau, County of Prince William, Virginia, 1993.

Ferguson, Jerry T. "Evaluating the Effectiveness of Use-Value Programs." *Property Tax Journal* 7, no. 2 (1988): 157-165.

Fisher, Peter S. "Introduction: Public Policy and the Urbanization of Farmland." *International Regional Science Review* 7, no.3 (1982): 249-256.

Furuseth, Owen J. "Public Attitudes Toward Local Farmland Protection Programs." *Growth and Change* 18 (1987): 49-61.

GA/Partners. "Fiscal Impact Analysis Belmont Center Prince William County, Virginia." Washington, D.C.: GA/Partners, A Unit of the Arthur Anderson & Co. Real Estate Services Group, 1990.

Hady, Thomas F. and Ann Gordon Sibold. *State Programs for the Differential Assessment of Farm and Open Space Land.* Washington, D.C.: United States Department of Agriculture, Economic Research Service, Economic Development Division, Agricultúral Economic Report No. 256, 1974.

Harmston, Floyd K. *The Community as an Economic System*. Ames, Iowa: The Iowa State University Press, 1983.

Hart, John F. "Urban Encroachment of Rural Areas." *The Geographical Review* 66, no.1 (1976): 3-17.

Johnson, Thomas G. and John R. Keeling. *The Virginia Impact Projection (VIP) Model: Manuals and Applications*. Photocopy. Virginia Polytechnic Institute and State University, 1986.

Kambhampaty, S. Murthy. "A Method of Evaluating the Impact of Economic Change on the Service of Local Governments." Master's thesis, Virginia Polytechnic Institute and State University, 1990.

Keeling, John R. "A Fiscal Impact Model for Virginia Localities." Master's thesis, Virginia Polytechnic Institute and State University, 1986.

Keene, John C. "The Impact of Differential Assessment Programs on the Tax Base." In *Property Tax Incentives for Preservation: Use-Value Assessment and the Preservation of Farmland, Open Space, and Historic Sites*. Proceedings of the 1975 Property Tax Forum International Association of Assessing Officers Research and Technical Services Department. Washington, D.C.: International Association of Assessing Officers, 1975.

Ladd, Helen F. "Municipal Expenditures and the Composition of the Local Property Tax Base." In *Property Taxation, Land Use & Public Policy*, edited by Arthur D. Lynn, Jr. Madison, Wisconsin: The University of Wisconsin Press, 1976.

Mieszkowski, Peter. "The Property Tax: An Excise Tax Or A Profits Tax?" *Journal of Public Economics* 1 (1972): 73-96.

Mulligan, George R. "A Comparative Assessment of Purchase of Development Rights (PDR) and Transfer of Development Rights (TDR) as Tools for the Preservation of Agricultural Land." Major Paper, Virginia Polytechnic Institute and State University, 1980.

National Agricultural Lands Study (U.S.) *Final Report 1981*. Washington, D.C.: U.S. Government Printing Office, 1981.

Netzer, Dick. *Economics of the Property Tax*. Washington D.C.: The Brookings Institution, 1966.

Oates, William E. "The Effects of Property Taxes and Local Public Spending on Property Values: A Empirical Study of Tax Capitalization and the Tiebout Hypothesis." *Journal of Political Economy* 77 (1969): 957-971.

Owen, Michael S. and Wayne R. Thirsk. "Land Taxes and Idle Land: A Case Study of Houston." *Land Economics* 50, no.3 (1974): 251-260.

Pindyck, Robert S. and Daniel L. Rubinfeld. *Econometric Models and Economic Forecasts*. New York: McGraw-Hill, Inc., 1991.

Samuelson, Paul A. "The Pure Theory of Public Expenditures." *The Review of Economics and Statistics* 36 (1954): 387-389.

Sazama, Geraldo W. and Harlan Davis. "Land Taxation and Land Reform." *Economic Development and Cultural Change* (1973): 642-654.

Stocker, Frederick D. *How Should We Tax Farmland in the Rural-Urban Fringe?* Proceedings of the Fifty-fourth Annual Conference on Taxation. Seattle, Washington: National Tax Association, 1961: 463-71.

Stocker, Frederick D. "The Impact of Ad Valorem Assessment on the Preservation of Open Space and the Pattern of Urban Growth." In *Property Tax Incentives for Preservation: Use-Value Assessment and the Preservation of Farmland, Open Space, and Historic Sites*. Proceedings of the 1975 Property Tax Forum International Association of Assessing Officers Research and Technical Services Department. Washington, D.C.: International Association of Assessing Officers, 1975.

Stoll, John R., Fred C. White, Rod F. Ziemer, John C. Bergstrom, and Robert S. Kao. *Differential Assessment of Agricultural Lands in the South*. Southern Rural Development Center, 1984.

Tiebout, Charles M. "A Pure Theory of Local Expenditures." *Journal of Political Economy* 64, no. 5 (1956): 416-424.

Vesterby, Marlow, Ralph E. Heimlich, and Kenneth S. Krupa. *Urbanization of Rural Land in the United States*. Washington, D.C.: United States Department of Agriculture, Economic Research Service, Agricultural Economic Report Number 673, 1994.

Vining, Daniel R., Jr., Thomas Plaut, and Kenneth Bieri. "Urban Encroachment on Prime Agricultural Land in the United States." *International Regional Science Review* 2, no 2 (1977): 143-156.

Wehrly, Max S. and J. Ross McKeever. *Urban Land Use and Property Taxation*. Washington, D.C.: Urban Land Institute Technical Bulletin No. 18, 1952.

Wunderlich, Gene and John Blackledge. *Taxing Farmland in the United States*. Washington, D.C.: United States Department of Agriculture, Economic Research Service, Agricultural Economic Report Number 679, 1994.

VI Appendix

The results of the statistical estimations are presented here. Structural and reduced form parameter estimates are reported along with test statistics.

VI.1 Systems Estimation

Three stage least squares (3SLS) estimation of expenditure, non-local aid and property value equations obtained from the SAS SYSLIN Procedure:

VI.1.1 First Round Estimation Results

3SLS Estimation of Expenditure, Non-Local Aid, and Property Value Equations:
SYSLIN Procedure
Two-Stage Least Squares Estimation

Model: A1
Dependent variable: COPSCAP

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	9	23530.68701	2614.52078	9.928	0.0001
Error	84	22122.00163	263.35716		
C Total	93	45684.10740			

Root MSE	16.22828	R-Square	0.5154
Dep Mean	39.94000	Adj R-SQ	0.4635
C.V.	40.63165		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	-27.009629	19.811547	-1.363	0.1764
SLCMCAP	1	-1.572810	0.924678	-1.701	0.0927
PCINC	1	0.002236	0.001696	1.319	0.1909
INCAP	1	18.005509	25.121419	0.717	0.4755
POP0	1	0.000053380	0.000028817	1.852	0.0675
CRIMECAP	1	1.053991	0.372689	2.828	0.0059
PCAGV	1	0.114493	0.147726	0.775	0.4405
EFFPCFMA	1	0.238549	0.136504	1.748	0.0842
NLPSCAP	1	-0.023927	0.259007	-0.092	0.9266
MVALBIPC	1	0.000113	0.000237	0.476	0.6352

Model: A2
Dependent variable: CDSCAP

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	8	3404.19826	425.52478	6.046	0.0001
Error	85	5982.31332	70.38016		
C Total	93	11192.61784			

Root MSE	8.38929	R-Square	0.3627
Dep Mean	18.29319	Adj R-SQ	0.3027
C.V.	45.86017		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	-26.578079	9.343448	-2.845	0.0056
SLCMCAP	1	1.136095	0.482644	2.354	0.0209
PCINC	1	0.001611	0.000774	2.082	0.0404
CRIMECAP	1	-0.015493	0.175081	-0.088	0.9297
PCTRACE	1	-0.133900	0.057881	-2.313	0.0231
PCAGV	1	0.062545	0.075851	0.825	0.4119
EFFPCFMA	1	0.105518	0.062460	1.689	0.0948
NLPSCAP	1	0.248935	0.114971	2.165	0.0332
MVALBIPC	1	-0.000009568	0.000121	-0.079	0.9372

Model: A3
Dependent variable: CRTSCAP

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	7	881.49915	125.92845	12.258	0.0001
Error	86	883.46946	10.27290		
C Total	93	3314.04992			

Root MSE	3.20514	R-Square	0.4994
Dep Mean	13.76798	Adj R-SQ	0.4587
C.V.	23.27965		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	1.542195	2.641717	0.584	0.5609
SLCMCAP	1	0.151692	0.147937	1.025	0.3081
PCAGV	1	-0.073781	0.027182	-2.714	0.0080
EFFPCFMA	1	-0.014151	0.021070	-0.672	0.5036
COPSCAP	1	0.042382	0.027017	1.569	0.1204
CDSCAP	1	0.035020	0.075084	0.466	0.6421
NLCRTCAP	1	0.830474	0.112944	7.353	0.0001
MVALBIPC	1	0.000046590	0.000029765	1.565	0.1212

Model: A4
Dependent variable: FIRECAP

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	6	20909.34897	3484.89150	32.809	0.0001
Error	87	9240.87381	106.21694		
C Total	93	30212.97271			

Root MSE	10.30616	R-Square	0.6935
Dep Mean	16.22340	Adj R-SQ	0.6724
C.V.	63.52650		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	5.362044	7.394610	0.725	0.4703
CRIMECAP	1	0.441824	0.132844	3.326	0.0013
POP0	1	0.000077348	0.000015635	4.947	0.0001
PCAGV	1	-0.135537	0.090683	-1.495	0.1386
EFFPCFMA	1	-0.081306	0.074096	-1.097	0.2755
NLPSCAP	1	-0.050753	0.148852	-0.341	0.7340
MVALBIPC	1	0.000283	0.000075350	3.753	0.0003

Model: A5
Dependent variable: WFARCAP

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	6	18619.33538	3103.22256	10.728	0.0001
Error	87	25166.42609	289.26927		
C Total	93	47770.38948			

Root MSE	17.00792	R-Square	0.4252
Dep Mean	51.41330	Adj R-SQ	0.3856
C.V.	33.08078		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	18.781573	19.527336	0.962	0.3388
PCINC	1	-0.003126	0.001668	-1.874	0.0643
POP0	1	0.000099979	0.000025270	3.956	0.0002
PCTRACE	1	0.262350	0.112568	2.331	0.0221
PCAGV	1	-0.141297	0.136869	-1.032	0.3048
EFFPCFMA	1	0.490697	0.106674	4.600	0.0001
MVALBIPC	1	0.000787	0.000239	3.291	0.0014

Model: A6
Dependent variable: HWCAP

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	6	53090.58289	8848.43048	24.816	0.0001
Error	87	31021.15378	356.56499		
C Total	93	114910.02457			

Root MSE	18.88293	R-Square	0.6312
Dep Mean	87.20702	Adj R-SQ	0.6058
C.V.	21.65299		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	-19.867161	12.424586	-1.599	0.1134
POP0	1	0.000097880	0.000026309	3.720	0.0004
ELDER	1	-1.149566	0.637203	-1.804	0.0747
PCAGV	1	0.038544	0.148789	0.259	0.7962
EFFPCFMA	1	0.398257	0.140653	2.831	0.0058
NLHWCAP	1	2.107986	0.293994	7.170	0.0001
MVALBIPC	1	0.000556	0.000144	3.867	0.0002

Model: A7
Dependent variable: FUNCAP

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	6	19505.67988	3250.94665	22.015	0.0001
Error	87	12847.09515	147.66776		
C Total	93	34925.04766			

Root MSE	12.15186	R-Square	0.6029
Dep Mean	17.69404	Adj R-SQ	0.5755
C.V.	68.67771		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	-31.017799	9.284594	-3.341	0.0012
POP0	1	0.000053738	0.000016131	3.331	0.0013
OUTCAP	1	39.538170	15.269117	2.589	0.0113
PCAGV	1	-0.302124	0.095230	-3.173	0.0021
EFFPCFMA	1	0.209605	0.074136	2.827	0.0058
NLFUNCAP	1	4.648215	1.373940	3.383	0.0011
MVALBIPC	1	0.000562	0.000085391	6.586	0.0001

Model: A8
Dependent variable: DEVCAP

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	5	8936.20510	1787.24102	15.636	0.0001
Error	88	10058.41483	114.30017		
C Total	93	21740.14249			

Root MSE	10.69113	R-Square	0.4705
Dep Mean	16.56032	Adj R-SQ	0.4404
C.V.	64.55869		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	-1.181981	6.928012	-0.171	0.8649
BUSCAP	1	-0.540347	0.263515	-2.051	0.0433
PCAGV	1	-0.250348	0.079793	-3.137	0.0023
EFFPCFMA	1	0.149253	0.067673	2.205	0.0300
NLDEVCAP	1	0.237598	1.294698	0.184	0.8548
MVALBIPC	1	0.000633	0.000090831	6.973	0.0001

Model: A9
Dependent variable: PWCAP

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	5	28337.92207	5667.58441	6.619	0.0001
Error	88	75347.64134	856.22320		
C Total	93	106835.42095			

Root MSE	29.26129	R-Square	0.2733
Dep Mean	42.22500	Adj R-SQ	0.2320
C.V.	69.29850		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	30.895692	18.463651	1.673	0.0978
BUSCAP	1	-0.746045	0.716501	-1.041	0.3006
PCAGV	1	-0.740672	0.226260	-3.274	0.0015
EFFPCFMA	1	0.386863	0.186479	2.075	0.0409
NLPWCAP	1	0.898724	0.303831	2.958	0.0040
MVALBIPC	1	0.000339	0.000257	1.322	0.1897

Model: A10
Dependent variable: ADMCAP

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	6	24918.34156	4153.05693	12.992	0.0001
Error	87	27809.68573	319.65156		
C Total	93	69311.89694			

Root MSE	17.87880	R-Square	0.4726
Dep Mean	50.13245	Adj R-SQ	0.4362
C.V.	35.66313		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	-1.946627	20.954509	-0.093	0.9262
PCINC	1	0.001665	0.001758	0.947	0.3462
POP0	1	0.000010635	0.000028623	0.372	0.7111
PCAGV	1	-0.376892	0.151889	-2.481	0.0150
EFFPCFMA	1	0.079639	0.138668	0.574	0.5672
NLADCAP	1	1.246755	0.608785	2.048	0.0436
MVALBIPC	1	0.000567	0.000255	2.227	0.0285

Model: A11
Dependent variable: SCHLPUP

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	8	18.89607	2.36201	5.857	0.0001
Error	85	34.27590	0.40325		
C Total	93	50.69763			

Root MSE	0.63502	R-Square	0.3554
Dep Mean	4.40050	Adj R-SQ	0.2947
C.V.	14.43055		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	1.553283	1.463436	1.061	0.2915
PCINC	1	-0.000009032	0.000068878	-0.131	0.8960
ENR0	1	0.000007781	0.000005963	1.305	0.1955
TEAPUP	1	0.002598	0.034460	0.075	0.9401
PCCHGENR	1	0.008597	0.018349	0.469	0.6406
PCAGV	1	-0.000634	0.005211	-0.122	0.9035
EFFPCFMA	1	0.015922	0.004116	3.868	0.0002
MVALBIPC	1	0.000030906	0.000010928	2.828	0.0058
NLEDCAP	1	0.001349	0.001355	0.996	0.3223

Model: A12
Dependent variable: NLPWCAP

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	8	11326.35726	1415.79466	10375.260	0.0001
Error	85	11.59899	0.13646		
C Total	93	11338.07356			

Root MSE	0.36940	R-Square	0.9990
Dep Mean	2.09936	Adj R-SQ	0.9989
C.V.	17.59598		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	0.259520	0.468529	0.554	0.5811
PCINC	1	-0.000010776	0.000035227	-0.306	0.7604
SALECAP	1	-0.000007206	0.000020125	-0.358	0.7212
PCAGV	1	0.008523	0.003224	2.644	0.0098
EFFPCFMA	1	-0.000788	0.002514	-0.313	0.7548
DUM_ARL	1	74.128061	0.459812	161.214	0.0001
DUM_BUCH	1	20.077654	0.393311	51.048	0.0001
DUM_HENR	1	76.295636	0.395536	192.892	0.0001
MVALBIPC	1	0.000001382	0.000005446	0.254	0.8003

Model: A13
Dependent variable: NLCRTCAP

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	6	1061.71273	176.95212	18.648	0.0001
Error	87	825.55432	9.48913		
C Total	93	2727.17841			

Root MSE	3.08044	R-Square	0.5626
Dep Mean	12.00309	Adj R-SQ	0.5324
C.V.	25.66376		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	-1.177356	2.287552	-0.515	0.6081
PCCHGPOP	1	-0.009815	0.071607	-0.137	0.8913
PCAGV	1	0.078614	0.025071	3.136	0.0023
EFFPCFMA	1	0.030309	0.020433	1.483	0.1416
CRTSCAP	1	0.935527	0.117454	7.965	0.0001
COPSCAP	1	-0.063175	0.024684	-2.559	0.0122
MVALBIPC	1	-0.000037086	0.000027416	-1.353	0.1796

Model: A14
Dependent variable: NLPSCAP

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	6	7341.85376	1223.64229	6.856	0.0001
Error	87	15528.12497	178.48420		
C Total	93	23771.64352			

Root MSE	13.35980	R-Square	0.3210
Dep Mean	41.28202	Adj R-SQ	0.2742
C.V.	32.36227		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	11.595750	9.102815	1.274	0.2061
POP0	1	-0.000050869	0.000020620	-2.467	0.0156
PCUNEMP	1	-0.285237	0.712385	-0.400	0.6898
PCAGV	1	0.204954	0.105714	1.939	0.0558
EFFPCFMA	1	0.306181	0.078665	3.892	0.0002
PUBSFCAP	1	0.012280	0.055306	0.222	0.8248
MVALBIPC	1	0.000111	0.000122	0.912	0.3643

Model: A15
Dependent variable: NLADCAP

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	5	1246.98283	249.39657	14.550	0.0001
Error	88	1508.40295	17.14094		
C Total	93	3116.03924			

Root MSE	4.14016	R-Square	0.4526
Dep Mean	10.49266	Adj R-SQ	0.4215
C.V.	39.45770		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	-3.747838	2.714615	-1.381	0.1709
SALECAP	1	-0.000639	0.000223	-2.860	0.0053
PCAGV	1	0.105266	0.035289	2.983	0.0037
EFFPCFMA	1	0.126804	0.024945	5.083	0.0001
ADMCAP	1	0.077537	0.040032	1.937	0.0560
MVALBIPC	1	0.000021461	0.000046607	0.460	0.6463

Model: A16
Dependent variable: NLFUNCAP

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	7	20.73503	2.96215	1.309	0.2561
Error	86	194.67811	2.26370		
C Total	93	216.03292			

Root MSE	1.50456	R-Square	0.0963
Dep Mean	1.74287	Adj R-SQ	0.0227
C.V.	86.32643		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	3.698582	1.969490	1.878	0.0638
PCINC	1	-0.000006275	0.000165	-0.038	0.9698
SALECAP	1	-0.000227	0.000088110	-2.573	0.0118
POPDENS	1	0.000125	0.000310	0.402	0.6885
OUTCAP	1	-4.008773	2.432437	-1.648	0.1030
PCAGV	1	0.004710	0.012956	0.363	0.7171
EFFPCFMA	1	-0.007437	0.010675	-0.697	0.4879
MVALBIPC	1	0.000011570	0.000022902	0.505	0.6147

Model: A17
Dependent variable: NLHWCAP

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	5	4401.27376	880.25475	5.845	0.0001
Error	88	13252.20868	150.59328		
C Total	93	23286.14304			

Root MSE	12.27165	R-Square	0.2493
Dep Mean	31.78394	Adj R-SQ	0.2067
C.V.	38.60958		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	39.094664	13.735756	2.846	0.0055
PCINC	1	-0.002756	0.001112	-2.478	0.0151
PCAGV	1	-0.096064	0.101385	-0.948	0.3460
EFFPCFMA	1	-0.013301	0.084298	-0.158	0.8750
HWCAP	1	0.221195	0.073235	3.020	0.0033
MVALBIPC	1	0.000309	0.000203	1.524	0.1312

Model: A18
Dependent variable: NLEDCAP

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	7	455757.66491	65108.23784	7.184	0.0001
Error	86	779450.00185	9063.37211		
C Total	93	998063.29892			

Root MSE	95.20174	R-Square	0.3690
Dep Mean	401.86862	Adj R-SQ	0.3176
C.V.	23.68977		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	708.794599	150.997580	4.694	0.0001
PCINC	1	-0.010380	0.009064	-1.145	0.2553
SCHLPUP	1	55.899634	34.251179	1.632	0.1063
PCCHGENR	1	1.292735	2.750156	0.470	0.6395
TEAPUP	1	-8.158151	4.876527	-1.673	0.0980
PCAGV	1	-0.890234	0.757865	-1.175	0.2434
EFFPCFMA	1	-1.609824	0.781674	-2.059	0.0425
MVALBIPC	1	-0.004276	0.001720	-2.487	0.0148

Model: A19
Dependent variable: NLDEVCAP

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	7	7.00914	1.00131	0.299	0.9526
Error	86	288.34148	3.35281		
C Total	93	313.73515			

Root MSE	1.83107	R-Square	0.0237
Dep Mean	0.79511	Adj R-SQ	-0.0557
C.V.	230.29213		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	1.638406	1.211370	1.353	0.1798
BUSCAP	1	0.029282	0.049112	0.596	0.5526
GRAD	1	-0.000222	0.000231	-0.961	0.3392
PCCHGPOP	1	0.017932	0.039503	0.454	0.6510
PCAGV	1	0.000782	0.016456	0.048	0.9622
EFFPCFMA	1	-0.011786	0.013484	-0.874	0.3845
DEVCAP	1	0.022058	0.039130	0.564	0.5744
MVALBIPC	1	-0.000023362	0.000028332	-0.825	0.4119

Model: A20
Dependent variable: MVALBIPC

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	7	28610387581	4087198225.9	32.159	0.0001
Error	86	10930173272	127095038.05		
C Total	93	39109380011			

Root MSE	11273.64351	R-Square	0.7236
Dep Mean	36151.78221	Adj R-SQ	0.7011
C.V.	31.18420		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	-59422	12962	-4.584	0.0001
PCINC	1	2.864776	0.910993	3.145	0.0023
BUSCAP	1	935.917312	298.994099	3.130	0.0024
OUTCAP	1	5405.138280	19442	0.278	0.7817
SQMILE	1	-1.638978	7.356002	-0.223	0.8242
PCAGV	1	171.927070	89.310519	1.925	0.0575
EFFPCFMA	1	-225.282788	89.319330	-2.522	0.0135
SCHLPUP	1	12159	3462.704027	3.512	0.0007

3SLS Estimation of Expenditure, Non-Local Aid, and Property Value Equations:
SYSLIN Procedure
Three-Stage Least Squares Estimation

Model: A1
Dependent variable: COPSCAP

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	-8.982921	15.623831	-0.575	0.5669
SLCMCAP	1	-0.351039	0.589112	-0.596	0.5529
PCINC	1	0.000815	0.001175	0.694	0.4894
INCAP	1	-9.992223	15.830690	-0.631	0.5296
POP0	1	0.000044512	0.000022669	1.964	0.0529
CRIMECAP	1	0.591262	0.246690	2.397	0.0188
PCAGV	1	0.104822	0.136342	0.769	0.4442
EFFPCFMA	1	0.356825	0.115193	3.098	0.0027
NLPSCAP	1	-0.478949	0.181913	-2.633	0.0101
MVALBIPC	1	0.000513	0.000184	2.788	0.0066

Model: A2
Dependent variable: CDSCAP

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	-24.643707	8.821972	-2.793	0.0064
SLCMCAP	1	1.180338	0.411192	2.871	0.0052
PCINC	1	0.001633	0.000702	2.325	0.0225
CRIMECAP	1	-0.042252	0.151043	-0.280	0.7804
PCTRACE	1	-0.138973	0.049046	-2.834	0.0057
PCAGV	1	0.079135	0.073584	1.075	0.2852
EFFPCFMA	1	0.124720	0.060071	2.076	0.0409
NLPSCAP	1	0.168811	0.101934	1.656	0.1014
MVALBIPC	1	-0.000021611	0.000111	-0.195	0.8461

Model: A3
Dependent variable: CRTSCAP

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	2.080817	2.119616	0.982	0.3290
SLCMCAP	1	0.024409	0.057147	0.427	0.6704
PCAGV	1	-0.084571	0.024745	-3.418	0.0010
EFFPCFMA	1	-0.022978	0.019273	-1.192	0.2364
COPSCAP	1	0.046279	0.023196	1.995	0.0492
CDSCAP	1	0.016223	0.029502	0.550	0.5838
NLCRTCAP	1	0.943126	0.068174	13.834	0.0001
MVALBIPC	1	0.000050021	0.000026761	1.869	0.0650

Model: A4
Dependent variable: FIRECAP

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	10.785319	6.992028	1.543	0.1266
CRIMECAP	1	0.210415	0.104529	2.013	0.0472
POP0	1	0.000069178	0.000013451	5.143	0.0001
PCAGV	1	-0.209113	0.086353	-2.422	0.0175
EFFPCFMA	1	-0.085649	0.068666	-1.247	0.2156
NLPSCAP	1	-0.068214	0.117898	-0.579	0.5644
MVALBIPC	1	0.000349	0.000072320	4.827	0.0001

Model: A5
Dependent variable: WFARCAP

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	29.003502	16.203920	1.790	0.0769
PCINC	1	-0.004224	0.001249	-3.382	0.0011
POP0	1	0.000080240	0.000021782	3.684	0.0004
PCTRACE	1	0.227223	0.053524	4.245	0.0001
PCAGV	1	-0.211257	0.132810	-1.591	0.1153
EFFPCFMA	1	0.476434	0.101446	4.696	0.0001
MVALBIPC	1	0.001001	0.000194	5.169	0.0001

Model: A6
Dependent variable: HWCAP

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	-20.130036	11.641039	-1.729	0.0873
POP0	1	0.000061984	0.000015877	3.904	0.0002
ELDER	1	-0.548003	0.199812	-2.743	0.0074
PCAGV	1	-0.027285	0.142697	-0.191	0.8488
EFFPCFMA	1	0.293764	0.112110	2.620	0.0104
NLHWCAP	1	2.169367	0.148114	14.647	0.0001
MVALBIPC	1	0.000590	0.000130	4.541	0.0001

Model: A7
Dependent variable: FUNCAP

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	-24.329129	8.516655	-2.857	0.0054
POP0	1	0.000023973	0.000013748	1.744	0.0847
OUTCAP	1	17.200077	11.739296	1.465	0.1465
PCAGV	1	-0.340399	0.093321	-3.648	0.0005
EFFPCFMA	1	0.170148	0.072066	2.361	0.0205
NLFUNCAP	1	4.653412	0.941136	4.944	0.0001
MVALBIPC	1	0.000662	0.000082659	8.010	0.0001

Model: A8

Dependent variable: DEVCAP

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	-6.725188	6.720189	-1.001	0.3197
BUSCAP	1	-0.193322	0.218060	-0.887	0.3777
PCAGV	1	-0.231394	0.079479	-2.911	0.0046
EFFPCFMA	1	0.131925	0.065108	2.026	0.0458
NLDEVCAP	1	1.387353	0.921085	1.506	0.1356
MVALBIPC	1	0.000592	0.000083909	7.060	0.0001

Model: A9

Dependent variable: PWCAP

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	30.148514	18.300851	1.647	0.1030
BUSCAP	1	-0.132749	0.644127	-0.206	0.8372
PCAGV	1	-0.676314	0.223117	-3.031	0.0032
EFFPCFMA	1	0.296327	0.181729	1.631	0.1065
NLPWCAP	1	1.087257	0.251307	4.326	0.0001
MVALBIPC	1	0.000157	0.000243	0.647	0.5190

Model: A10

Dependent variable: ADMCAP

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	15.329476	16.921947	0.906	0.3675
PCINC	1	0.000276	0.001281	0.216	0.8296
POP0	1	-0.000001730	0.000021780	-0.079	0.9369
PCAGV	1	-0.494864	0.142754	-3.467	0.0008
EFFPCFMA	1	-0.026918	0.118879	-0.226	0.8214
NLADCAP	1	1.730866	0.390844	4.429	0.0001
MVALBIPC	1	0.000747	0.000204	3.660	0.0004

Model: A11

Dependent variable: SCHLPUP

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	2.109483	0.809596	2.606	0.0108
PCINC	1	-0.000073810	0.000049703	-1.485	0.1412
ENR0	1	0.000000869	0.000002957	0.294	0.7697
TEAPUP	1	-0.009420	0.018124	-0.520	0.6046
PCCHGENR	1	0.008871	0.009014	0.984	0.3278
PCAGV	1	-0.004443	0.004932	-0.901	0.3702
EFFPCFMA	1	0.014619	0.003855	3.793	0.0003
MVALBIPC	1	0.000045526	0.000007804	5.833	0.0001
NLEDCAP	1	0.001713	0.000548	3.129	0.0024

Model: A12
Dependent variable: NLPWCAP

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	0.226139	0.449864	0.503	0.6165
PCINC	1	-0.000001455	0.000033583	-0.043	0.9656
SALECAP	1	0.000000645	0.000018825	0.034	0.9727
PCAGV	1	0.009640	0.003168	3.043	0.0031
EFFPCFMA	1	-0.001373	0.002467	-0.557	0.5792
DUM_ARL	1	74.495710	0.426999	174.464	0.0001
DUM_BUCH	1	20.097188	0.354982	56.615	0.0001
DUM_HENR	1	76.291337	0.356993	213.705	0.0001
MVALBIPC	1	-0.000001417	0.000005241	-0.270	0.7875

Model: A13
Dependent variable: NLCRTCAP

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	-1.404554	1.981930	-0.709	0.4804
PCCHGPOP	1	0.001694	0.025713	0.066	0.9476
PCAGV	1	0.079318	0.023792	3.334	0.0013
EFFPCFMA	1	0.031083	0.018171	1.711	0.0907
CRTSCAP	1	0.947384	0.063333	14.959	0.0001
COPSCAP	1	-0.061213	0.020456	-2.992	0.0036
MVALBIPC	1	-0.000040117	0.000024969	-1.607	0.1118

Model: A14
Dependent variable: NLPSCAP

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	10.879021	8.513249	1.278	0.2047
POP0	1	-0.000017271	0.000014385	-1.201	0.2331
PCUNEMP	1	-0.168352	0.448985	-0.375	0.7086
PCAGV	1	0.214526	0.102524	2.092	0.0393
EFFPCFMA	1	0.325806	0.076877	4.238	0.0001
PUBSFCAP	1	-0.051553	0.039531	-1.304	0.1956
MVALBIPC	1	0.000175	0.000107	1.630	0.1067

Model: A15
Dependent variable: NLADCAP

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	-5.257333	2.592309	-2.028	0.0456
SALECAP	1	-0.000394	0.000142	-2.772	0.0068
PCAGV	1	0.124697	0.032609	3.824	0.0002
EFFPCFMA	1	0.123194	0.024143	5.103	0.0001
ADMCAP	1	0.102062	0.027303	3.738	0.0003
MVALBIPC	1	-0.000003729	0.000037154	-0.100	0.9203

Model: A16

Dependent variable: NLFUNCAP

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	5.042638	1.810984	2.784	0.0066
PCINC	1	-0.000323	0.000148	-2.185	0.0316
SALECAP	1	-0.000153	0.000076576	-2.001	0.0486
POPDENS	1	0.000222	0.000266	0.835	0.4061
OUTCAP	1	0.874995	2.119513	0.413	0.6808
PCAGV	1	-0.002463	0.012624	-0.195	0.8458
EFFPCFMA	1	-0.006932	0.010206	-0.679	0.4988
MVALBIPC	1	0.000047810	0.000021107	2.265	0.0260

Model: A17

Dependent variable: NLHWCAP

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	31.017736	10.170671	3.050	0.0030
PCINC	1	-0.002221	0.000664	-3.345	0.0012
PCAGV	1	-0.062561	0.093805	-0.667	0.5066
EFFPCFMA	1	-0.015955	0.075502	-0.211	0.8331
HWCAP	1	0.267616	0.040170	6.662	0.0001
MVALBIPC	1	0.000219	0.000128	1.712	0.0903

Model: A18

Dependent variable: NLEDCAP

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	582.832168	121.739509	4.788	0.0001
PCINC	1	-0.001945	0.007980	-0.244	0.8080
SCHLPUP	1	76.479526	21.434202	3.568	0.0006
PCCHGENR	1	0.825156	2.022046	0.408	0.6842
TEAPUP	1	-7.231217	3.728482	-1.939	0.0557
PCAGV	1	-0.565061	0.743293	-0.760	0.4492
EFFPCFMA	1	-1.846273	0.662632	-2.786	0.0066
MVALBIPC	1	-0.006316	0.001423	-4.439	0.0001

Model: A19

Dependent variable: NLDEVCAP

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	1.615065	1.199463	1.346	0.1817
BUSCAP	1	0.019356	0.046408	0.417	0.6777
GRAD	1	-0.000245	0.000218	-1.122	0.2652
PCCHGPOP	1	0.021539	0.036325	0.593	0.5548
PCAGV	1	-0.004916	0.016075	-0.306	0.7605
EFFPCFMA	1	-0.008597	0.013124	-0.655	0.5142
DEVCAP	1	0.001753	0.036079	0.049	0.9614
MVALBIPC	1	-0.000010815	0.000026563	-0.407	0.6849

Model: A20
Dependent variable: MVALBIPC

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	-55169	11099	-4.971	0.0001
PCINC	1	3.231568	0.629196	5.136	0.0001
BUSCAP	1	637.851759	191.226726	3.336	0.0013
OUTCAP	1	-16626	9788.206325	-1.699	0.0930
SQMILE	1	-1.712302	3.846700	-0.445	0.6573
PCAGV	1	180.169289	86.145071	2.091	0.0394
EFFPCFMA	1	-240.409446	76.155303	-3.157	0.0022
SCHLPUP	1	12893	2059.333622	6.261	0.0001

VI.1.2 Second Round Estimation Results

3SLS estimation of exp., NL aid, and property value eqns.:
SYSLIN Procedure
Two-Stage Least Squares Estimation

Model: A1
Dependent variable: COPSCAP

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	5	21757.39847	4351.47969	14.225	0.0001
Error	88	26920.11490	305.91040		
C Total	93	45684.10740			

Root MSE	17.49029	R-Square	0.4470
Dep Mean	39.94000	Adj R-SQ	0.4155
C.V.	43.79142		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	-5.542024	12.127039	-0.457	0.6488
POP0	1	0.000058555	0.000027006	2.168	0.0328
MVALBIPC	1	0.000503	0.000129	3.889	0.0002
EFFPCFMA	1	0.247987	0.127386	1.947	0.0548
CRIMECAP	1	0.672063	0.210422	3.194	0.0019
NLPSCAP	1	-0.188800	0.257128	-0.734	0.4647

Model: A2
Dependent variable: CDSCAP

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	6	3202.35213	533.72536	7.345	0.0001
Error	87	6321.75432	72.66384		
C Total	93	11192.61784			

Root MSE	8.52431	R-Square	0.3362
Dep Mean	18.29319	Adj R-SQ	0.2905
C.V.	46.59826		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	.1	-25.924318	8.139345	-3.185	0.0020
SLCMCAP	1	1.132019	0.304951	3.712	0.0004
PCINC	1	0.001558	0.000364	4.278	0.0001
PCTRACE	1	-0.133259	0.058089	-2.294	0.0242
NLPSCAP	1	0.183608	0.115764	1.586	0.1164
PCAGV	1	0.083185	0.076457	1.088	0.2796
EFFPCFMA	1	0.126108	0.064290	1.962	0.0530

Model: A3
Dependent variable: CRTSCAP

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	5	442.92280	88.58456	6.833	0.0001
Error	88	1140.91800	12.96498		
C Total	93	3314.04992			

Root MSE	3.60069	R-Square	0.2797
Dep Mean	13.76798	Adj R-SQ	0.2387
C.V.	26.15265		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	4.286399	2.510449	1.707	0.0913
COPSCAP	1	0.057040	0.032257	1.768	0.0805
NLCRTCAP	1	0.627017	0.163220	3.842	0.0002
MVALBIPC	1	0.000039971	0.000031781	1.258	0.2118
PCAGV	1	-0.076840	0.027725	-2.772	0.0068
EFFPCFMA	1	0.000589	0.024609	0.024	0.9810

Model: A4
Dependent variable: FIRECAP

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	5	20897.77271	4179.55454	40.662	0.0001
Error	88	9045.23660	102.78678		
C Total	93	30212.97271			

Root MSE	10.13838	R-Square	0.6979
Dep Mean	16.22340	Adj R-SQ	0.6808
C.V.	62.49232		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	4.735373	7.097798	0.667	0.5064
MVALBIPC	1	0.000277	0.000071331	3.879	0.0002
PCAGV	1	-0.145257	0.084832	-1.712	0.0904
EFFPCFMA	1	-0.096109	0.058244	-1.650	0.1025
CRIMECAP	1	0.442652	0.130649	3.388	0.0011
POP0	1	0.000079727	0.000013666	5.834	0.0001

Model: A5
Dependent variable: WFARCAP

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	6	18113.60466	3018.93411	10.458	0.0001
Error	87	25115.01826	288.67837		
C Total	93	47770.38948			

Root MSE	16.99054	R-Square	0.4190
Dep Mean	51.41330	Adj R-SQ	0.3790
C.V.	33.04697		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	16.337219	19.623976	0.833	0.4074
PCINC	1	-0.002805	0.001690	-1.660	0.1006
MVALBIPC	1	0.000734	0.000243	3.017	0.0034
PCAGV	1	-0.134050	0.136876	-0.979	0.3301
EFFPCFMA	1	0.493154	0.106587	4.627	0.0001
POP0	1	0.000098672	0.000025270	3.905	0.0002
PCTRACE	1	0.263961	0.112462	2.347	0.0212

Model: A6
Dependent variable: HWCAP

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	5	50128.18961	10025.63792	25.280	0.0001
Error	88	34899.60205	396.58639		
C Total	93	114910.02457			

Root MSE	19.91448	R-Square	0.5896
Dep Mean	87.20702	Adj R-SQ	0.5662
C.V.	22.83586		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	-19.481893	12.684822	-1.536	0.1282
MVALBIPC	1	0.000517	0.000156	3.317	0.0013
EFFPCFMA	1	0.374482	0.149680	2.502	0.0142
POP0	1	0.000098421	0.000026474	3.718	0.0004
ELDER	1	-1.153495	0.672180	-1.716	0.0897
NLHWCAP	1	2.227740	0.347134	6.418	0.0001

Model: A7
Dependent variable: FUNCAP

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	6	18498.02441	3083.00407	21.068	0.0001
Error	87	12731.16334	146.33521		
C Total	93	34925.04766			

Root MSE	12.09691	R-Square	0.5923
Dep Mean	17.69404	Adj R-SQ	0.5642
C.V.	68.36713		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	-27.613025	9.207404	-2.999	0.0035
MVALBIPC	1	0.000569	0.000085359	6.670	0.0001
PCAGV	1	-0.294865	0.095717	-3.081	0.0028
EFFPCFMA	1	0.193331	0.073729	2.622	0.0103
OUTCAP	1	30.661377	14.824736	2.068	0.0416
POP0	1	0.000053635	0.000016099	3.332	0.0013
NLFUNCAP	1	4.341812	1.888176	2.299	0.0239

Model: A8
Dependent variable: DEVCAP

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	4	8265.70611	2066.42653	17.533	0.0001
Error	89	10489.56973	117.86033		
C Total	93	21740.14249			

Root MSE	10.85635	R-Square	0.4407
Dep Mean	16.56032	Adj R-SQ	0.4156
C.V.	65.55641		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	-3.874356	7.105834	-0.545	0.5870
MVALBIPC	1	0.000513	0.000072244	7.098	0.0001
PCAGV	1	-0.224703	0.080002	-2.809	0.0061
EFFPCFMA	1	0.091130	0.062757	1.452	0.1500
NLDEVCAP	1	0.257213	1.596104	0.161	0.8723

Model: A9
Dependent variable: PWCAP

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	3	26700.80068	8900.26689	10.003	0.0001
Error	90	80075.94938	889.73277		
C Total	93	106835.42095			

Root MSE	29.82839	R-Square	0.2501
Dep Mean	42.22500	Adj R-SQ	0.2251
C.V.	70.64154		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	38.646736	12.154023	3.180	0.0020
PCAGV	1	-0.696170	0.227241	-3.064	0.0029
EFFPCFMA	1	0.233181	0.149825	1.556	0.1231
NLPWCAP	1	1.005874	0.290401	3.464	0.0008

Model: A10
Dependent variable: ADMCAP

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	3	21784.20192	7261.40064	22.850	0.0001
Error	90	28600.91088	317.78790		
C Total	93	69311.89694			

Root MSE	17.82661	R-Square	0.4324
Dep Mean	50.13245	Adj R-SQ	0.4134
C.V.	35.55902		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	22.564852	6.644355	3.396	0.0010
MVALBIPC	1	0.000776	0.000104	7.498	0.0001
PCAGV	1	-0.386047	0.146443	-2.636	0.0099
NLADCAP	1	0.821508	0.494354	1.662	0.1000

Model: A11
Dependent variable: SCHLPUP

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	4	17.60552	4.40138	10.937	0.0001
Error	89	35.81517	0.40242		
C Total	93	50.69763			

Root MSE	0.63436	R-Square	0.3296
Dep Mean	4.40050	Adj R-SQ	0.2994
C.V.	14.41573		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	0.833121	1.042640	0.799	0.4264
PCINC	1	0.000049058	0.000054757	0.896	0.3727
MVALBIPC	1	0.000026493	0.000008803	3.009	0.0034
EFFPCFMA	1	0.015906	0.003930	4.047	0.0001
NLEDCAP	1	0.001929	0.001245	1.550	0.1247

Model: A12
Dependent variable: NLPWCAP

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	4	11326.32412	2831.58103	21448.735	0.0001
Error	89	11.74944	0.13202		
C Total	93	11338.07356			

Root MSE	0.36334	R-Square	0.9990
Dep Mean	2.09936	Adj R-SQ	0.9989
C.V.	17.30718		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	0.073744	0.077021	0.957	0.3409
PCAGV	1	0.009014	0.002748	3.280	0.0015
DUM_ARL	1	74.066256	0.371414	199.417	0.0001
DUM_BUCH	1	20.096256	0.371414	54.107	0.0001
DUM_HENR	1	76.254520	0.370786	205.656	0.0001

Model: A13
Dependent variable: NLCRTCAP

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	5	640.51183	128.10237	13.438	0.0001
Error	88	838.90734	9.53304		
C Total	93	2727.17841			

Root MSE	3.08756	R-Square	0.4329
Dep Mean	12.00309	Adj R-SQ	0.4007
C.V.	25.72307		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	-0.836282	2.412928	-0.347	0.7297
CRTSCAP	1	0.911188	0.168721	5.401	0.0001
COPSCAP	1	-0.077226	0.026620	-2.901	0.0047
MVALBIPC	1	-0.000026919	0.000028560	-0.943	0.3485
PCAGV	1	0.072408	0.026790	2.703	0.0083
EFFPCFMA	1	0.034451	0.019775	1.742	0.0850

Model: A14
Dependent variable: NLPSCAP

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	5	7325.96801	1465.19360	7.715	0.0001
Error	88	16712.67201	189.91673		
C Total	93	23771.64352			

Root MSE	13.78103	R-Square	0.3048
Dep Mean	41.28202	Adj R-SQ	0.2653
C.V.	33.38264		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	10.939363	8.609779	1.271	0.2072
POP0	1	-0.000044671	0.000022345	-1.999	0.0487
MVALBIPC	1	0.000172	0.000129	1.333	0.1859
PCAGV	1	0.186195	0.109345	1.703	0.0921
EFFPCFMA	1	0.304846	0.079119	3.853	0.0002
PUBSFCAP	1	-0.021679	0.067284	-0.322	0.7481

Model: A15
Dependent variable: NLADCAP

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	4	1101.95587	275.48897	15.840	0.0001
Error	89	1547.89718	17.39210		

Root MSE	4.17038	R-Square	0.4159
Dep Mean	10.49266	Adj R-SQ	0.3896
C.V.	39.74573		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	-1.771295	2.755785	-0.643	0.5220
ADMCAP	1	0.066322	0.025936	2.557	0.0122
SALECAP	1	-0.000591	0.000215	-2.752	0.0072
PCAGV	1	0.101812	0.033643	3.026	0.0032
EFFPCFMA	1	0.117000	0.021380	5.473	0.0001

Model: A16
Dependent variable: NLFUNCAP

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	3	14.90227	4.96742	2.181	0.0957
Error	90	204.94538	2.27717		
C Total	93	216.03292			

Root MSE	1.50903	R-Square	0.0678
Dep Mean	1.74287	Adj R-SQ	0.0367
C.V.	86.58292		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	3.107968	0.901266	3.448	0.0009
PCINC	1	-0.000135	0.000116	-1.162	0.2482
SALECAP	1	-0.000169	0.000075563	-2.234	0.0279
MVALBIPC	1	0.000028384	0.000020031	1.417	0.1599

Model: A17
Dependent variable: NLHWCAP

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	3	3858.38061	1286.12687	8.576	0.0001
Error	90	13496.69957	149.96333		
C Total	93	23286.14304			

Root MSE	12.24595	R-Square	0.2223
Dep Mean	31.78394	Adj R-SQ	0.1964
C.V.	38.52874		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	33.694489	9.432848	3.572	0.0006
PCINC	1	-0.002519	0.000997	-2.527	0.0132
HWCAP	1	0.213873	0.066227	3.229	0.0017
MVALBIPC	1	0.000303	0.000190	1.598	0.1135

Model: A18
Dependent variable: NLEDCAP

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	4	434627.38787	108656.84697	10.436	0.0001
Error	89	926675.11940	10412.07999		
C Total	93	998063.29892			

Root MSE	102.03960	R-Square	0.3193
Dep Mean	401.86862	Adj R-SQ	0.2887
C.V.	25.39128		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	602.618549	150.180353	4.013	0.0001
SCHLPUP	1	63.549187	38.651000	1.644	0.1037
TEAPUP	1	-9.356036	4.737840	-1.975	0.0514
MVALBIPC	1	-0.005909	0.001249	-4.730	0.0001
EFFPCFMA	1	-1.623642	0.812881	-1.997	0.0488

Model: A19
Dependent variable: NLDEVCAP

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	1	2.03411	2.03411	0.600	0.4404
Error	92	311.70104	3.38805		
C Total	93	313.73515			

Root MSE	1.84067	R-Square	0.0065
Dep Mean	0.79511	Adj R-SQ	-0.0043
C.V.	231.49945		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	0.858153	0.206552	4.155	0.0001
GRAD	1	-0.000142	0.000184	-0.775	0.4404

Model: A20
Dependent variable: MVALBIPC

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	6	28582760236	4763793372.6	36.385	0.0001
Error	87	11390791037	130928632.61		
C Total	93	39109380011			

Root MSE	11442.40502	R-Square	0.7150
Dep Mean	36151.78221	Adj R-SQ	0.6954
C.V.	31.65101		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	-62340	12124	-5.142	0.0001
PCINC	1	2.618459	0.966756	2.708	0.0081
BUSCAP	1	979.949876	289.107424	3.390	0.0011
OUTCAP	1	9669.178294	18796	0.514	0.6083
PCAGV	1	164.035032	88.075793	1.862	0.0659
EFFPCFMA	1	-241.681006	93.756961	-2.578	0.0116
SCHLPUP	1	13277	3836.169363	3.461	0.0008

3SLS Estimation of Expenditure, Non-Local Aid, and Property Value Equations:
SYSLIN Procedure
Three-Stage Least Squares Estimation

Model: A1
Dependent variable: COPSCAP

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	4.274258	9.915005	0.431	0.6675
POP0	1	0.000050156	0.000018351	2.733	0.0076
MVALBIPC	1	0.000608	0.000113	5.357	0.0001
EFFPCFMA	1	0.293680	0.096726	3.036	0.0032
CRIMECAP	1	0.317677	0.140825	2.256	0.0266
NLPSCAP	1	-0.420764	0.145998	-2.882	0.0050

Model: A2
Dependent variable: CDSCAP

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	-22.319953	7.528868	-2.965	0.0039
SLCMCAP	1	1.131760	0.256302	4.416	0.0001
PCINC	1	0.001466	0.000338	4.330	0.0001
PCTRACE	1	-0.122930	0.047121	-2.609	0.0107
NLPSCAP	1	0.046063	0.097243	0.474	0.6369
PCAGV	1	0.122761	0.069664	1.762	0.0815
EFFPCFMA	1	0.153602	0.058970	2.605	0.0108

Model: A3
Dependent variable: CRTSCAP

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	2.176652	2.335733	0.932	0.3539
COPSCAP	1	0.069309	0.029202	2.373	0.0198
NLCRTCAP	1	0.923390	0.112588	8.201	0.0001
MVALBIPC	1	0.000037106	0.000030470	1.218	0.2266
PCAGV	1	-0.073443	0.026156	-2.808	0.0061
EFFPCFMA	1	-0.024359	0.022402	-1.087	0.2798

Model: A4
Dependent variable: FIRECAP

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	9.364662	6.258544	1.496	0.1382
MVALBIPC	1	0.000332	0.000067509	4.925	0.0001
PCAGV	1	-0.182133	0.064772	-2.812	0.0061
EFFPCFMA	1	-0.109441	0.053139	-2.060	0.0424
CRIMECAP	1	0.217847	0.101798	2.140	0.0351
POP0	1	0.000075076	0.000011389	6.592	0.0001

Model: A5
Dependent variable: WFARCAP

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	22.500558	15.437730	1.458	0.1486
PCINC	1	-0.003631	0.001259	-2.884	0.0050
MVALBIPC	1	0.000890	0.000192	4.638	0.0001
PCAGV	1	-0.029176	0.077870	-0.375	0.7088
EFFPCFMA	1	0.462406	0.094168	4.910	0.0001
POP0	1	0.000082789	0.000020418	4.055	0.0001
PCTRACE	1	0.213834	0.054911	3.894	0.0002

Model: A6
Dependent variable: HWCAP

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	-17.594286	8.954571	-1.965	0.0526
MVALBIPC	1	0.000552	0.000123	4.474	0.0001
EFFPCFMA	1	0.269075	0.070481	3.818	0.0003
POP0	1	0.000063991	0.000014915	4.290	0.0001
ELDER	1	-0.585469	0.195928	-2.988	0.0036
NLHWCAP	1	2.185918	0.184990	11.816	0.0001

Model: A7
Dependent variable: FUNCAP

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	-19.051211	7.824676	-2.435	0.0169
MVALBIPC	1	0.000669	0.000077951	8.584	0.0001
PCAGV	1	-0.282787	0.080999	-3.491	0.0008
EFFPCFMA	1	0.125918	0.064917	1.940	0.0557
OUTCAP	1	4.583776	10.506460	0.436	0.6637
POP0	1	0.000025027	0.000012240	2.045	0.0439
NLFUNCAP	1	4.287003	1.308389	3.277	0.0015

Model: A8
Dependent variable: DEVCAP

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	-9.228904	5.811546	-1.588	0.1158
MVALBIPC	1	0.000541	0.000062463	8.660	0.0001
PCAGV	1	-0.140622	0.063961	-2.199	0.0305
EFFPCFMA	1	0.104792	0.053002	1.977	0.0511
NLDEVCAP	1	1.899804	1.042468	1.822	0.0718

Model: A9
Dependent variable: PWCAP

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	35.365717	11.935469	2.963	0.0039
PCAGV	1	-0.480132	0.204521	-2.348	0.0211
EFFPCFMA	1	0.204288	0.147482	1.385	0.1694
NLPWCAP	1	1.196805	0.234208	5.110	0.0001

Model: A10
Dependent variable: ADMCAP

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	16.833599	5.692863	2.957	0.0040
MVALBIPC	1	0.000800	0.000101	7.929	0.0001
PCAGV	1	-0.350264	0.105698	-3.314	0.0013
NLADCAP	1	1.205767	0.372148	3.240	0.0017

Model: A11
Dependent variable: SCHLPUP

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	1.667764	0.601612	2.772	0.0068
PCINC	1	-0.000045679	0.000029874	-1.529	0.1298
MVALBIPC	1	0.000041756	0.000005398	7.735	0.0001
EFFPCFMA	1	0.014141	0.003287	4.302	0.0001
NLEDCAP	1	0.001766	0.000608	2.907	0.0046

Model: A12
Dependent variable: NLPWCAP

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	0.042619	0.073597	0.579	0.5640
PCAGV	1	0.010153	0.002595	3.912	0.0002
DUM_ARL	1	74.330872	0.343691	216.272	0.0001
DUM_BUCH	1	20.147201	0.334421	60.245	0.0001
DUM_HENR	1	76.338916	0.333981	228.573	0.0001

Model: A13
Dependent variable: NLCRTCAP

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	-0.424505	1.976391	-0.215	0.8304
CRTSCAP	1	0.900130	0.095853	9.391	0.0001
COPSCAP	1	-0.068993	0.021412	-3.222	0.0018
MVALBIPC	1	-0.000036282	0.000023784	-1.525	0.1307
PCAGV	1	0.070253	0.021808	3.221	0.0018
EFFPCFMA	1	0.031857	0.017701	1.800	0.0753

Model: A14
Dependent variable: NLPSCAP

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	11.519766	7.682726	1.499	0.1373
POP0	1	-0.000018380	0.000014257	-1.289	0.2007
MVALBIPC	1	0.000173	0.000093051	1.855	0.0670
PCAGV	1	0.185305	0.087480	2.118	0.0370
EFFPCFMA	1	0.318815	0.072227	4.414	0.0001
PUBSFCAP	1	-0.054169	0.043156	-1.255	0.2127

Model: A15
Dependent variable: NLADCAP

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	-4.068911	2.388463	-1.704	0.0920
ADMCAP	1	0.080238	0.021333	3.761	0.0003
SALECAP	1	-0.000368	0.000131	-2.809	0.0061
PCAGV	1	0.103879	0.030337	3.424	0.0009
EFFPCFMA	1	0.125234	0.020606	6.078	0.0001

Model: A16
Dependent variable: NLFUNCAP

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	3.665279	0.833415	4.398	0.0001
PCINC	1	-0.000235	0.000105	-2.236	0.0278
SALECAP	1	-0.000164	0.000066321	-2.471	0.0153
MVALBIPC	1	0.000046790	0.000018094	2.586	0.0113

Model: A17
Dependent variable: NLHWCAP

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	26.974089	5.620973	4.799	0.0001
PCINC	1	-0.002069	0.000593	-3.491	0.0007
HWCAP	1	0.259895	0.039468	6.585	0.0001
MVALBIPC	1	0.000222	0.000118	1.885	0.0626

Model: A18
Dependent variable: NLEDCAP

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	486.414287	99.931136	4.867	0.0001
SCHLPUP	1	101.296542	22.694630	4.463	0.0001
TEAPUP	1	-6.745388	2.767066	-2.438	0.0168
MVALBIPC	1	-0.007187	0.000861	-8.346	0.0001
EFFPCFMA	1	-2.189340	0.636388	-3.440	0.0009

Model: A19
Dependent variable: NLDEVCAP

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	0.909719	0.204506	4.448	0.0001
GRAD	1	-0.000259	0.000172	-1.508	0.1351

Model: A20
Dependent variable: MVALBIPC

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	-59407	10141	-5.858	0.0001
PCINC	1	2.782785	0.593688	4.687	0.0001
BUSCAP	1	672.631599	167.614427	4.013	0.0001
OUTCAP	1	-5197.004977	10066	-0.516	0.6070
PCAGV	1	119.867045	53.766540	2.229	0.0284
EFFPCFMA	1	-265.132578	68.282276	-3.883	0.0002
SCHLPUP	1	14973	2314.285378	6.470	0.0001

3SLS estimation of exp., NL aid, and property value eqns.:
SYSLIN Procedure
Three-Stage Least Squares Estimation
Reduced Form for Exogenous Variables

	SLCMCAP	PCINC	POP0	CRIMECAP	PCTRACE
COPSCAP	0.0263	0.002339	0.000061	0.3301	-0.002860
CDSCAP	1.1289	0.001486	-1.183E-6	-0.001364	-0.1226
CRTSCAP	0.000874	0.000166	2.0226E-6	0.0110	-0.000095
FIRECAP	-8.43E-17	0.001379	0.0000751	0.2178	0
WFARCAP	-2.26E-16	0.0000617	0.0000828	-1.41E-17	0.2138
HWCAP	-6.09E-16	-0.000504	0.000148	-3.81E-17	0
FUNCAP	-2.21E-16	0.002602	0.000025	-1.38E-17	0
DEVCAP	-1.37E-16	0.002244	-4.19E-21	-8.57E-18	0
PWCAP	0	0	0	0	0
ADMCAP	-2.24E-16	0.003673	-6.85E-21	-1.4E-17	0
SCHLPUP	-8.97E-18	0.0000912	-2.74E-22	-5.61E-19	0
NLPWCAP	0	0	0	0	0
NLCRTCAP	-0.001030	-0.000162	-2.385E-6	-0.0129	0.000112
NLPSCAP	-0.0626	0.000434	-0.000026	-0.0296	0.006797
NLADCAP	-1.8E-17	0.000295	-5.5E-22	-1.13E-18	0
NLFUNCAP	-1.19E-17	-0.000041	-3.62E-22	-7.41E-19	0
NLHWCAP	-2.15E-16	-0.001278	0.0000385	-1.34E-17	0
NLEDCAP	9.13E-16	-0.0206	2.786E-20	5.707E-17	0
NLDEVCAP	0	0	0	0	0
MVALBIPC	-2.54E-13	4.1484	-7.74E-18	-1.58E-14	0
PUBSFCAP	1.1552	0.005204	0.000135	0.5466	-0.1255

	ELDER	GRAD	BUSCAP	TEAPUP	SALECAP
COPSCAP	0	0	0.7953	-0.2569	0
CDSCAP	0	0	0.008184	-0.002644	0
CRTSCAP	0	0	0.0569	-0.0184	0
FIRECAP	0	0	0.4758	-0.1537	0
WFARCAP	0	0	1.2738	-0.4114	0
HWCAP	-1.3556	0	3.4377	-1.1104	0
FUNCAP	0	0	1.2447	-0.4020	-0.000703
DEVCAP	0	-0.000492	0.7741	-0.2500	0
PWCAP	0	0	0	0	0
ADMCAP	0	0	1.2670	-0.4093	-0.000492
SCHLPUP	0	0	0.0507	-0.0309	0
NLPWCAP	0	0	0	0	0
NLCRTCAP	0	0	-0.0555	0.0179	0
NLPSCAP	0	0	0.1777	-0.0574	0
NLADCAP	0	0	0.1017	-0.0328	-0.000408
NLFUNCAP	0	0	0.0670	-0.0216	-0.000164
NLHWCAP	-0.3523	0	1.2114	-0.3913	0
NLEDCAP	0	0	-5.1534	-6.5506	0
NLDEVCAP	0	-0.000259	0	0	0
MVALBIPC	0	0	1431	-462.2467	0
PUBSFCAP	0	0	1.2792	-0.4132	0

3SLS estimation of exp., NL aid, and property value eqns.:
SYSLIN Procedure
Three-Stage Least Squares Estimation
Reduced Form for Exogenous Variables

	PCAGV	EFFPCFMA	DUM_ARL	DUM_BUCH
COPSCAP	0.0608	0.0727	0	0
CDSCAP	0.1331	0.1668	0	0
CRTSCAP	-0.0433	0.0288	0	0
FIRECAP	-0.0973	-0.1645	0	0
WFARCAP	0.1978	0.3151	0	0
HWCAP	0.6126	0.2255	0	0
FUNCAP	-0.0610	-0.0180	0	0
DEVCAP	-0.002668	0.0153	0	0
PWCAP	-0.4680	0.2043	88.9596	24.1123
ADMCAP	-0.0233	0.0207	0	0
SCHLPUP	0.009027	0.006656	0	0
NLPWCAP	0.0102	0	74.3309	20.1472
NLCRTCAP	0.0178	0.0588	0	0
NLPSCAP	0.2241	0.2862	0	0
NLADCAP	0.1020	0.1269	0	0
NLFUNCAP	0.0119	-0.007743	0	0
NLHWCAP	0.2159	0.0218	0	0
NLEDCAP	-0.9184	-0.3259	0	0
NLDEVCAP	0	0	0	0
MVALBIPC	255.0275	-165.4782	0	0
PUBSFCAP	0.0965	0.0750	0	0

	DUM_HENR	INTERCEP
COPSCAP	0	-16.6322
CDSCAP	0	-21.9184
CRTSCAP	0	9.4138
FIRECAP	0	-0.0628
WFARCAP	0	-2.7384
HWCAP	0	27.6711
FUNCAP	0	-27.9998
DEVCAP	0	-22.8390
PWCAP	91.3628	35.4167
ADMCAP	0	-11.9000
SCHLPUP	0	2.0739
NLPWCAP	76.3389	0.0426
NLCRTCAP	0	10.2254
NLPSCAP	0	8.7180
NLADCAP	0	-5.0237
NLFUNCAP	0	2.3385
NLHWCAP	0	27.8656
NLEDCAP	0	900.2662
NLDEVCAP	0	0.9097
MVALBIPC	0	-28355
PUBSFCAP	0	-38.6134

SIMLIN Derivation of Reduced Form from 3SLS Estimates:
SIMLIN Procedure
Statistics of Fit

Variable	N	Mean Error	Mean % Error	Mean Abs Error	Mean Abs % Error
COPSCAP	94	-1.1923	-18.7581	13.1588	37.82481
CDSCAP	94	-0.0388	-273.2141	7.1999	296.87763
CRTSCAP	94	-0.0939	-23.0664	4.5891	43.68741
FIRECAP	94	-0.8457	-32.7824	7.8915	69.39445
WFARCAP	94	-2.2640	-17.4019	15.3114	34.20076
HWCAP	94	-6.1102	-18.2231	26.8037	33.64166
FUNCAP	94	-1.1578	.	9.7905	.
DEVCAP	94	-1.3759	-58.6410	9.7220	83.48188
PWCAP	94	4.817E-13	-30.4702	19.0148	53.46065
ADMCAP	94	-2.2520	-19.9053	16.2633	35.29914
SCHLPUP	94	-0.0900	-3.6938	0.4853	10.92276
NLPWCAP	94	3.076E-15	.	0.2340	.
NLCRTCAP	94	0.0901	-17.0340	3.8818	37.58408
NLPSCAP	94	-0.8415	-16.1180	10.2439	32.10421
NLADCAP	94	-0.1807	-17.5589	3.5293	39.55832
NLFUNCAP	94	-0.1190	.	1.2653	.
NLHWCAP	94	-2.1532	-36.1457	12.3375	54.74001
NLEDCAP	94	9.1597	-0.8878	55.7754	14.58071
NLDEVCAP	94	-6.6E-15	.	0.9605	.
MVALBIPC	94	-2544	-12.0667	8424	26.17119
PUBSFCAP	94	7.4313	-0.8017	23.6654	27.20835

Statistics of Fit

Variable	RMS Error	RMS % Error
COPSCAP	16.8387	50.2230
CDSCAP	9.3255	1838
CRTSCAP	5.7924	67.5012
FIRECAP	10.3363	90.5153
WFARCAP	19.7626	45.2037
HWCAP	32.7224	41.7408
FUNCAP	15.4857	.
DEVCAP	13.2262	119.1581
PWCAP	29.4090	71.7713
ADMCAP	23.4811	47.1349
SCHLPUP	0.6785	14.5457
NLPWCAP	0.3548	.
NLCRTCAP	4.9921	51.6148
NLPSCAP	13.2183	64.1478
NLADCAP	4.5516	50.9075
NLFUNCAP	1.4775	.
NLHWCAP	15.7060	86.4302
NLEDCAP	77.9679	20.0952
NLDEVCAP	1.8250	.
MVALBIPC	11640	33.5963
PUBSFCAP	33.2936	32.0973

SIMLIN Derivation of Reduced Form from 3SLS Estimates:
SIMLIN Procedure
Actual and Predicted Values

OBS	_NAME_	_LABEL_	COL1
1	COPSCAP		99.85
2	CDSCAP		45.91
3	CRTSCAP		20
4	FIRECAP		75.7
5	WFARCAP		49.46
6	HWCAP		109.97
7	FUNCAP		27.4
8	DEVCAP		25.79
9	PWCAP		59.49
10	ADMCAP		87.93
11	SCHLPUP		5.0824309182
12	NLPWCAP		0.34
13	NLCRTCAP		7.84
14	NLPSCAP		21.3
15	NLADCAP		2.54
16	NLFUNCAP		2.07
17	NLHWCAP		29.42
18	NLEDCAP		442.65
19	NLDEVCAP		0.6
20	PUBSFCAP		258.17
21	MVALBIPC		57381.759595
22	PREDA1	Predicted Value for COPSCAP	61.19865159
23	PREDA2	Predicted Value for CDSCAP	17.384249238
24	PREDA3	Predicted Value for CRTSCAP	14.295846632
25	PREDA4	Predicted Value for FIRECAP	49.291258691
26	PREDA5	Predicted Value for WFARCAP	41.134202201
27	PREDA6	Predicted Value for HWCAP	92.04955314
28	PREDA7	Predicted Value for FUNCAP	29.78929291
29	PREDA8	Predicted Value for DEVCAP	23.118658982
30	PREDA9	Predicted Value for PWCAP	38.351450703
31	PREDA10	Predicted Value for ADMCAP	61.760186698
32	PREDA11	Predicted Value for SCHLPUP	4.164813547
33	PREDA12	Predicted Value for NLPWCAP	0.0911122139
34	PREDA13	Predicted Value for NLCRTCAP	7.3590120011
35	PREDA14	Predicted Value for NLPSCAP	19.11469738
36	PREDA15	Predicted Value for NLADCAP	2.0120266251
37	PREDA16	Predicted Value for NLFUNCAP	1.0835586915
38	PREDA17	Predicted Value for NLHWCAP	27.597814331
39	PREDA18	Predicted Value for NLEDCAP	350.02544299
40	PREDA19	Predicted Value for NLDEVCAP	0.2566734189
41	PREDA20	Predicted Value for MVALBIPC	55236.62002
42	PREDB1	Predicted Value for PUBSFCAP	127.87415952
43	LOCALITY		Princewi

3SLS Estimation of Expenditure, Non-Local Aid, and Property Value Equations:
Variable Means

Variable	N	Mean	Std Dev	Minimum	Maximum
COPSCAP	94	39.9400000	22.1636405	13.5000000	146.0300000
CDSCAP	94	18.2931915	10.9704480	0.0900000	49.7300000
CRTSCAP	94	13.7679787	5.9695013	3.1900000	31.8400000
FIRECAP	94	16.2234043	18.0241692	2.5000000	95.0300000
WFARCAP	94	51.4132979	22.6640707	22.8100000	156.0200000
HWCAP	94	87.2070213	35.1509838	40.8300000	241.0100000
FUNCAP	94	17.6940426	19.3788066	0	144.9800000
DEVCAP	94	16.5603191	15.2893745	3.5600000	100.9900000
PWCAP	94	42.2250000	33.8934797	11.4200000	239.9700000
ADMCAP	94	50.1324468	27.2999856	22.5700000	191.9900000
SCHLPUP	94	4.4004989	0.7383331	3.0519020	8.4415217
NLPWCAP	94	2.0993617	11.0415021	0	76.3400000
NLCRTCAP	94	12.0030851	5.4152100	3.4400000	27.9900000
NLPSCAP	94	41.2820213	15.9877788	5.7300000	113.8600000
NLADCAP	94	10.4926596	5.7884193	2.5400000	39.3900000
NLFUNCAP	94	1.7428723	1.5241177	0	6.1100000
NLHWCAP	94	31.7839362	15.8236732	7.4800000	85.0500000
NLEDCAP	94	401.8686170	103.5947075	122.3700000	824.7300000
NLDEVCAP	94	0.7951064	1.8367080	0	13.6600000
MVALBIPC	94	36151.78	20506.85	15147.67	144452.68
PUBSFCAP	94	83.9645745	48.8169597	38.8900000	328.8800000
SLCMCAP	94	7.0303255	3.2814788	1.4867272	20.7175970
PCINC	94	12514.88	3089.78	7709.00	24707.00
INCAP	94	0.1295395	0.0996474	0.0222485	0.7576286
POP0	94	41501.20	90680.43	2635.00	818584.00
CRIMECAP	94	20.2794375	9.9622051	3.6596523	59.9171620
PCTRACE	94	18.4491763	16.6024319	0.1138500	63.1805000
ELDER	94	13.5378723	4.0797525	3.0300000	25.8600000
GRAD	94	442.4468085	1037.88	0	9493.00
BUSCAP	94	20.1518746	5.4954295	10.5132511	41.9419971
ENR0	94	6943.97	14569.62	387.0000000	128762.00
TEAPUP	94	15.1968085	2.4957362	0	22.3000000
SALECAP	94	4127.60	2169.12	760.9849768	10843.13
PCUNEMP	94	5.5044280	2.3901109	0.5417501	12.3396727
PCCHGENR	94	0.0748334	3.7979815	-21.5083799	6.0726989
PCCHGPOP	94	1.6660659	6.1862481	-8.3830409	30.4613636
POPDENS	94	177.7825741	709.2069469	6.3341346	6574.46
PCAGV	94	23.5935547	14.3458110	0	76.8519831
EFFPCFMA	94	76.7289209	21.0434974	23.2248963	100.0000000
DUM_ARL	94	0.0106383	0.1031421	0	1.0000000
DUM_BUCH	94	0.0106383	0.1031421	0	1.0000000
DUM_HENR	94	0.0106383	0.1031421	0	1.0000000
SQMILE	94	402.8191489	180.8227887	26.0000000	972.0000000

Vita

Cheryl Fung received her Bachelor of Science degree, majoring in Resource Economics, from the University of New Hampshire in December 1989.