AN ASSESSMENT OF THE EFFECT OF THE INVESTMENT TAX CREDIT ON CAPITAL INVESTMENT IN FARM SUPPLY COOPERATIVES IN MICHIGAN, MINNESOTA, NORTH DAKOTA, AND WISCONSIN

DISSERTATION

Presented to the Graduate Council of the North Texas State University in Partial Fulfillment of the Requirements

For the Degree of

DOCTOR OF PHILOSOPHY

By

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May, 1986
Milacek, Emil C. Jr., *An Assessment of the Effect of the Investment Tax Credit on Capital Investment in Farm Cooperatives in Michigan, Minnesota, North Dakota, and Wisconsin*. Doctor of Philosophy (Accounting), May 1986, 97 pp., 8 tables, bibliography, 72 titles.

The purpose of this study is to shed more light on whether the investment tax credit is effective in stimulating capital investment. The sample includes 104 local cooperatives. The majority of the data was collected from the files of the St. Paul, Minnesota, Bank for Cooperatives.

The study has a single purpose of determining whether the changes to the Internal Revenue Code in the Revenue Tax Act of 1978 had an effect on the capital expenditure levels of farm supply cooperatives. In 1978 the investment tax credit became fully available to cooperatives. Previous abatement rules were abolished, and unused credit was then passed through in full to the cooperative membership.

The research model employed is a pooled time-series and cross-sectional approach, and includes data for years 1975 through 1983. In addition to capital expenditure data, the company-specific variables are debt/asset ratio, local margin, and net margin. Economic variables are a net interest-inflation rate factor, cash receipts from farming, and loan volume of banks for cooperatives. Also included are dummy variables 0 and 1, trend variables 1-9, and interaction variables for all the main-effects variables.
The report concludes that this study did not produce any reliable evidence that the investment tax credit positively affects the level of capital investment in farm supply cooperatives. Two shortcomings of the study are indicated. First, with a correlation coefficient of 10.58 per cent, the model lacks explanatory power. Lack of a measure of productive capacity is a likely cause of the specification error. Secondly, the time-series analysis is weakened because there were only three observation points (years 1975, 1976, and 1977) before the point of intrusion. Finally, the report recommends that further studies of this topic should employ the case study approach in order to more accurately assess the determinants of investment behavior.
TABLE OF CONTENTS

LIST OF TABLES ........................................ iii

Chapter

I. INTRODUCTION ......................... 1

   Background
   Cooperatives
   Investment Tax Credit
   Investment Tax Credit for Cooperatives

   Statement of the Problem
   Limitations and Assumptions
   Chapter Descriptions

II. PRIOR RESEARCH ............. 30

   Studies That Focused on the Central Issue
   of Investment Tax Credit
   Effectiveness
   The Hall and Jorgenson Study
   Machinery and Allied Products (MAPI)
   and Other Field Studies
   The Woodard and Panichi Study
   The Johnson and Carey Study

   Studies Reported in Unpublished
   Dissertations
   The Aaron, Russek, and Singer Study

   Studies That Focused on Peripheral Issues
   Summary

III. RESEARCH METHODOLOGY ..... 41

   The Data
   Analytic Procedures
   Model Development
### LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Example of Data Collected for Each Farm Supply Cooperative</td>
<td>59</td>
</tr>
<tr>
<td>II. Economic Variables</td>
<td>60</td>
</tr>
<tr>
<td>III. Summary of Model 1 Results, Simultaneous Values</td>
<td>65</td>
</tr>
<tr>
<td>IV. Summary of Model 1 Results, Incremental Values</td>
<td>66</td>
</tr>
<tr>
<td>V. Correlation Matrix</td>
<td>72</td>
</tr>
<tr>
<td>VI. Summary of Model 2 Results, Simultaneous Values</td>
<td>73</td>
</tr>
<tr>
<td>VII. Summary of Model 2 Results, Incremental Values</td>
<td>74</td>
</tr>
<tr>
<td>VIII. Summary of Descriptive Statistics</td>
<td>76</td>
</tr>
</tbody>
</table>
CHAPTER I

INTRODUCTION

In the Revenue Tax Act of 1978, Congress legislated a change in the investment tax credit provisions as they pertain to cooperative business entities. Codified as Section 46(h) of the Internal Revenue Code, the change mandates that tax credits unused at the cooperative level are to be passed through to the patrons of the cooperative. Section 46(h) is effective for tax years ending after October 31, 1978.

Since this specific provision of the tax code pertains only to cooperative businesses, it presents an opportunity to study the impact of the investment tax credit on a fairly well defined segment of the U. S. economy. The research undertaken in this dissertation is an attempt to determine what effect, if any, the change in investment tax credit provisions had on cooperative management decisions regarding capital expenditures. Presumably the increase in return on investment and the increase in available funds that result from the net tax reduction create an incentive for additional capital investment.

Because much of a cooperative's income is shielded from income tax if properly allocated to the cooperative patrons,
cooperative management is seldom able to utilize all the investment credit generated. Pass-through of unused credits to the patrons presumably affects the decision of cooperative management in that the boards of directors are comprised of active cooperative members whose costs are directly affected by the performance of the cooperative. Studying the levels of capital expenditures for cooperatives both before and after the enactment of Section 46(h) should be helpful in assessing the usefulness of the investment tax credit for its presumed purpose of stimulating capital investment.

Previous research on the effectiveness of the investment tax credit has not been extensive, and the results have been conflicting. Whether or not aggregate investment is responsive to the investment tax credit is still uncertain. Hopefully the results of this dissertation study will make a useful addition to the body of empirical research in accounting and taxation. Even though specifically applicable to cooperatives, the information should be generally useful in all deliberations about the investment tax credit.

Background

Cooperatives

The income tax laws have for decades recognized the distinctive characteristics of the cooperative form of doing business. Rulings on taxation of cooperative patronage
dividends were issued as far back as the early 1920s (4, p. 102). Specific legislative references to cooperatives first appeared in the 1916 Revenue Act (1, p. 313).

Taxation of cooperatives during the most recent two decades has been governed primarily by Internal Revenue Code Sections 521 and 1381-88. Section 521 provisions relate to the so-called "exempt" farm cooperatives, and are a carry-over from the 1939 Code. Sections 1381-88 comprise an extensive set of detailed rules for taxation of cooperatives in general, and were legislated in 1962 as a new Subchapter T of the tax code. In addition, numerous revenue rulings have been issued, and some landmark court cases have ensued.

A cooperative is a business firm organized for the benefit of its patrons. In theory, members of cooperatives join together for common marketing, supply, or service purposes. By so doing they expect to not only get better prices for their products, and to obtain their supplies and services at cost, but also to assure themselves of market outlets and sources of supply. Cooperative advocates insist they are not organized to obtain a tax advantage unavailable to others or to generate profits for members.

Nevertheless, cooperatives are organized for the purpose of providing the member with benefits that are either directly or indirectly financial in nature. These benefits differ somewhat from those provided by regular commercial business enterprises. In a cooperative, the financial
benefits flow to the patrons on the basis of business volume generated without reference to any level of owner investment, whereas in other businesses the benefits accrue to the owners on the basis of invested capital (12, p. 356).

The ways that cooperatives differ from other business organizations, including the differences mentioned above, are often condensed into four separate categories. First is the basic principle of member ownership and control, indicating that in effect the owners are dealing with themselves in any business transaction. Secondly there is the premise of operating on a cost basis, suggesting that amounts realized over and above business costs and expenses inure to the cooperative patrons. Thirdly there is the notion that cooperative members are primarily interested in the benefits received on the basis of patronage rather than some financial market rate-of-return on their investment, hence the financial returns on capital are limited. Fourth and finally is the obligation to finance the cooperative. Member-patrons assume the basic responsibility of providing capital, either by investing sums directly, or by allowing the cooperative to retain the profits (12, p. 358).

The majority of the tax legislation and tax rulings pertaining to cooperatives has dealt with taxation of cooperative earnings. Legislative history indicates that the intent of Congress was to tax all cooperative earnings either to the cooperative entity or to the patron, but not
both (4, p. 101). Prior to 1951 certain cooperatives were wholly exempt from the income tax. Much confusion seems to exist among the general public regarding the tax status of cooperatives, mostly because people tend to believe that cooperatives are fully exempt from income taxes when in fact the law permits cooperatives to avoid income taxes only if the income relates solely to business done with members of the cooperative, and then only if the cooperative follows the rather specific provisions of the tax code in making distributions of the income to the members.

Largely as a result of conflicting court decisions, Congress added Subchapter T to the tax code in 1962. Subchapter T contains definitive rules to be followed in determining the earnings eligible for taxation at the patron level rather than to the cooperative, and the distribution procedures to follow to "qualify" the earnings for such treatment. Earnings that qualify in this manner are available as special deductions on the cooperative tax return, and thereby escape corporate taxation.

Classification of cooperatives in terms of income tax status is far from exact. Farm cooperatives that expect to do a preponderance of their business with members (i.e., zero or minimal non-patronage income) may apply to the Internal Revenue Service for exempt status under Section 521. As implied earlier, the word "exempt" is somewhat misleading in that earnings of all cooperatives, exempt or
not, are subject to taxation under Subchapter T of the tax code. Section 1381(b) of the tax code states very specifically that organizations exempt from tax under Section 521 shall be subject to taxes imposed by Section 11 or Section 1201. Section 11 provides for taxation of corporate earnings. Section 1201 governs the corporate alternative tax.

As a result of the foregoing, taxation of Section 521 cooperatives is not only confusing but also the advantages of Section 521 status are somewhat obscure to the casual observer. The principal advantage of the Section 521 exemption is that these cooperatives are permitted a more liberal definition of distributed earnings that qualify as a tax deduction, and are thereby often able to reduce their taxable income to zero. On the other hand, cooperatives that are either ineligible for or undesirous of Section 521 status frequently incur tax liabilities for substantial portions of their income. However, the cooperatives that are "non-exempt" still are permitted a tax deduction for the patronage-sourced earnings that are properly distributed. The non-exempt cooperative has the additional advantage of being less constrained in controlling the volume of business conducted with non-members.

Of 5,795 agricultural cooperatives identified in a 1976 research study conducted by economists of the U. S. Department of Agriculture, forty-three per cent were operating under Section 521 of the Internal Revenue Code (7, p. iv).
A vast majority of cooperative businesses have a rural base, dealing either in agricultural products or in providing services in support of agriculture. It is difficult to divide these cooperatives into distinct groups because many of them are quite diversified in purpose. However, it is customary to segment farm cooperatives by function into either farm supply or marketing, and to designate them as a farm supply/marketing combination when neither function is dominant.

**Investment Tax Credit**

The investment tax credit (hereafter ITC) is the most significant tax credit in the income tax system. It is available to both corporate and individual taxpayers who invest in business assets. Like most tax credits, the ITC may be used as a direct subtraction from the taxpayer's gross tax liability.

The ITC provision was conceived, enacted, and implemented during the Kennedy Administration in the early 1960s, and was patterned after the tax laws of several European countries (16, p. 183). It was taken up by Congress as part of H. R. 10650, and became a central element in the Revenue Act of 1962 (17, p. 707). Upon enactment the ITC provisions were codified into the Internal Revenue Code of 1954 as Sections 38 and 46-48. Section 38 represents the basic authorization for the ITC; investments qualifying for the
credit are often referred to as "Section 38 property."

Sections 46-48 provide the rules and definitions for implementation of the ITC. This credit seems to have found a permanent place in our tax system, although it has been suspended, repealed, reinstated, and changed numerous times since 1962.

The economic effect of the ITC is to make the federal government a direct participant in capital investment of American business. Given that the stated objective of the ITC is to stimulate employment and investment in modern production facilities, Congress designed the ITC to benefit those business entities that regularly invest in rapidly depreciable assets such as machinery and equipment, and in certain "single-purpose" structures. Quite obviously this credit has had its most significant impact on tax savings in those entities that operate in capital-intensive industries. Many utility companies, for example, have generated ITC in excess of their income tax liabilities; therefore, they are unable to fully utilize the ITC to which they are entitled (8, p. 13-5). Literally billions of dollars are involved. The estimated impact of the ITC on the fiscal 1984 tax expenditure budget in terms of lost revenues is in excess of $15 billion dollars, rising to $27 billion by 1988 (3, p. 147). This compares to $1.35 billion of estimated revenue effect per year when the ITC was initially enacted in 1962 (17, p. 714).
Although, as stated earlier, the ITC has been repealed, suspended, and reinstated several times during its twenty-two year history, it has changed very little in substance since originally enacted. The formal, statutory definition of property that qualifies for the ITC remains as originally constructed, that is, "(1) tangible, depreciable personal property, and (2) real property, other than buildings and building components, that is used in manufacturing, production, extraction, or provision of services."(11, p. 112). Various interpretations of this definition have of course evolved through court decisions and from Treasury Department regulations and rulings.

The percentage rate used to compute the amount of the ITC was initially set at seven per cent of the qualifying investment. Under current law a ten per cent ITC is permitted for most qualifying assets of the typical industrial firm or of individual businesspersons and farmers. Relatively short-lived investments qualify for a six per cent credit. Other variations involve public utility property owners, who are entitled to an eleven per cent ITC, while taxpayers investing in the rehabilitation of historic structures may claim up to twenty-five per cent.

Obviously the ITC represents tax savings to the taxpayer and lost revenues to the federal government. As mentioned earlier, the federal government is actually sharing in the investment with the taxpayer. Accordingly it
can logically be argued that the taxpayer's cost basis in the asset should be reduced for depreciation purposes by the amount of the ITC claimed. In the Tax Equity and Fiscal Responsibility Act (TEFRA) of 1982 Congress moved to adopt the basis-reduction concept by including a provision in the law to reduce the depreciable basis of assets by one-half of claimed ITC. However, taxpayers were given an elective option to forgo a portion of the ITC in exchange for the right to recognize the full cost basis of the asset for cost recovery under the Accelerated Cost Recovery System (ACRS) that was introduced under the Economic Recovery Tax Act (ERTA) of 1981.

Like most provisions for income tax relief, the amount of ITC allowed to any particular taxpayer is limited. The principal limitation is applied by relating the potential ITC to the taxpayer's gross income tax liability. For any year after 1983 each taxpayer may claim ITC up to $25,000 plus eighty-five per cent on the excess over $25,000. Earlier the constraint was more severe, imposing percentage limitations of between fifty and eighty-five per cent on the gross tax liability in excess of $25,000. An additional limitation on the amount of ITC claimable involves used investment property. Qualifying investments in used property are limited to $125,000 annually per taxpayer.

Another form of constraint involves premature disposal of Section 38 property. If such property is disposed of
prior to the expiration of the useful life upon which the ITC claim is based, part or all of the ITC claimed must be recaptured. The ITC must be recomputed on the basis of the actual useful life over which the property was utilized, and any ITC recapture becomes an income tax liability for the year of property disposal.

Finally in regard to the ITC in general, it should be mentioned that for those taxpayers making Section 38 qualifying investments in years when they have no gross income tax liability to absorb the available credit, the benefit of the ITC is not necessarily lost to the taxpayer. The Internal Revenue Code permits a carryback of the unused ITC to any of the three most recent previous years, and forward for an additional fifteen years. Available ITC is consumed using a first-in, first-out procedure.

**Investment Tax Credit for Cooperatives**

From the time of initial implementation in 1962, and continuing until substantive changes were legislated in the Revenue Act of 1978, the ITC was available to cooperative businesses only in very limited amounts. The principal limiting factor was embodied in the statutes. Internal Revenue Code Section 46(e)(1)(C) stated that "in general . . . in the case of a cooperative organization the qualified investment, and the amount-of-tax limitation on the ITC, shall equal such person's ratable share of such items." Section
46(e)(2)(C) then furnished the specifics for implementation of the limitations, stipulating that the ITC allowable to a cooperative would be determined by a ratio in which the numerator is cooperative taxable income and the denominator is income before deducting the qualifying patronage dividend distributions.

Those pre-1978 rules governing ITC were very unfavorable to cooperative organizations. The significance of the limitations can best be emphasized when illustrated in an example:

Assume ABC is a calendar year cooperative that incurs a gross income tax liability on nonpatronage income. All of the patronage income is properly distributed as patronage dividends and is deducted in accordance with Section 1382 of the Internal Revenue Code. For the year ended December 31, 1977, ABC has patronage-sourced income of $170,000 and nonpatronage income of $30,000. During 1977 ABC made $800,000 of capital investment expenditures qualifying for a ten per cent ITC.

Section 46(e) Formula:

\[
\frac{\text{Taxable Income}}{\text{Taxable Income plus Section 1382 deduction}} \times \frac{\$30,000}{\$30,000 + \$170,000} = 15\%
\]

Potential ITC:

\[
\text{Qualifying Sect. 38 Property ($800,000 \times .15)} = \$120,000
\]

\[
\text{ITC Rate} = 10\%
\]

\[
\text{ITC tentatively claimable} = \$12,000
\]
Tax Liability Limitation:

<table>
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<th>Description</th>
<th>Amount</th>
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<tr>
<td>Tax on $30,000 income (at 1977 corporate rates)</td>
<td>$6,100</td>
</tr>
<tr>
<td>Section 46(e) limit on $25,000 base (at .15)</td>
<td>3,750</td>
</tr>
<tr>
<td>Excess Tax liability over base amount</td>
<td>2,350</td>
</tr>
<tr>
<td><strong>50% limitation (1977 rule. Currently 90%)</strong></td>
<td>1,175</td>
</tr>
<tr>
<td><strong>Base amount allowed (from above)</strong></td>
<td>3,750</td>
</tr>
<tr>
<td>ITC claimable by ABC in 1977</td>
<td>$4,925</td>
</tr>
<tr>
<td>ITC Carrybk/carryfwd ($12,000 less $4,925 used)</td>
<td>$7,075</td>
</tr>
</tbody>
</table>

Comparison with regular business corporation:

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>ITC Claimable by Regular Corp. ($800,000 x .1)</td>
<td>$80,000</td>
</tr>
<tr>
<td>ITC Claimable by ABC Cooperative (from above)</td>
<td>12,000</td>
</tr>
<tr>
<td>ITC permanently lost to ABC by Section 46(e)</td>
<td>$68,000</td>
</tr>
</tbody>
</table>

Again, the purpose of the foregoing illustration is to emphasize and highlight the inequitable treatment of cooperatives in regard to the ITC that existed prior to the Revenue Act of 1978. As shown in the illustration, the $68,000 of potential ITC removed by applying the Section 46(e) ratio resulted in immediate expiration of that portion of the potential credit.

The effect of eliminating the benefit of large portions of the potential ITC for cooperatives was inequitable because the cooperative and its participating member-patrons must be considered as related entities for income tax purposes, just as partnership businesses are related to the individual partners and S corporations are related to...
individual shareholders. Patronage-sourced income of the cooperative that is exempt from taxation at the cooperative level does not completely escape taxation. Such income is always allocated to the member-patrons for inclusion as taxable income on their individual tax returns.

The aim of Congress in regard to cooperatives was to impose only a single tax on the income that cooperatives derive from dealing with their membership, when such income is properly allocated and distributed, and the member-patrons formally agree to include the distributions as taxable income in their own tax returns. This special objective of the Congress effectively places the cooperative's patronage-sourced income in the same category as income of other tax-conduit entities such as the general partnership and the S corporation. In those entities it has long been accepted that where the income is passed through to individual owners for single taxation, it is also appropriate to pass through applicable credits generated by the business.

In addition, a second and most vital reason why the ITC generated by cooperatives should not be abated has to do with the prime objective of the ITC. The expressed purpose of this credit is to serve as an incentive for capital investment in business property, thereby stimulating the economy as discussed earlier. Income tax regulations that make the ITC ineffective for a large segment of American industry, such as cooperatives, seem to be inconsistent with
the intent of the legislature that enacted the ITC, and detract from the economic stimulation that the ITC presumably provides.

In any event cooperative proponents were successful in their arguments before Congress, advancing the rationale of unfairness to cooperatives in terms of tax equity, and pointing out that the investment incentive objective of the ITC is not likely to be achieved unless all of the generated ITC is realizable as a tax benefit to either the cooperative business that generates the investments, or to the member-patrons who own the cooperatives. The response of Congress can best be summarized by quoting the following passage from a Senate Committee Report of action on the Revenue Act of 1978:

REASONS FOR CHANGE. Cooperatives make a significant contribution to the American economy, particularly in the agricultural sector. The capital needs of cooperatives to finance expansion and modernization, coupled with the reduced level of investment credit available to these taxpayers, both hinders their growth and reduces the amount of patronage distributions which flow through to patrons. In light of these considerations and because the reductions in the corporate income tax rates (also provided in this bill) are of relatively limited benefit to cooperatives, the
committee has decided to liberalize the investment credit for cooperatives. (15, p. 118).

The Revenue Act of 1978 repealed the portions of Internal Revenue Code Section 46(e) that pertained to cooperatives, and at the same time added a new Section 46(h) that provides for passing-through to patrons the ITC that is not used by the cooperative in any given year. The effect of these changes is to allow cooperatives to compute investment credits under the same rules that govern other business enterprises. If the cooperative has sufficient gross tax liability to utilize all the ITC generated in any given year, then nothing unique occurs. On the other hand if the ITC generated exceeds the gross tax liability of the cooperative in a particular year, the excess ITC is passed through to the member-patrons for utilization on the patrons' tax returns. Carryback or carryforward of ITC is no longer permitted at the cooperative level. At the patron level the passed-through ITC is simply integrated with ITC generated by the patron from other sources.

Section 46(h) does not include any rules for implementation of the new legislation. Other than providing for the pass-through, and stipulating that any investment credit recapture will always become a tax liability of the cooperative rather than the patron even if the credit was originally passed through to patrons, the statute provides only that the rules necessary to carry out the purposes of the
new provision shall be prescribed by the Secretary of the Treasury.

The implementing regulations for Section 46(h) were not issued until late in 1983, more than five years after the new legislation became effective. Appearing as Treasury Regulation Section 1.46-10, the new regulations generally follow proposals of the National Council of Farmer Cooperatives (NCFC) (6, p. 15). Those proposals were developed by a subcommittee of the NCFC during 1979. A number of implementation problems are addressed, such as rules for allocation of ITC to individual patrons, time and manner of patron notification, and disposition of adjustments to cooperative ITC after pass-through has been effected. These subsidiary items will not be discussed in detail in this paper in that they do not bear directly on the issues under study.

Statement of the Problem

The use of various tax devices to stimulate capital investment has been a very popular element of tax policy for the last thirty years. During this time period, numerous methods of liberalizing depreciation, granting investment allowances, and other forms of income tax relief have become prevalent not only in the United States, but also throughout the rest of the free world (9, p. 391).
Regrettably, the various forms of tax stimulus that have been implemented for the purposes of altering investment behavior have not been well supported by any empirical evidence. Instead, the belief in these tools has always been based on the argument that people in pursuit of gain will purchase more capital goods if those goods are made to cost less (9, p. 391). This is not to say that significant research studies have not been performed. In fact, many of the congressional budget reports and legislative committee reports have indicated that evidence exists of a positive correlation between tax stimulus and capital investment. In general, however, the research that does exist has been inconclusive, and even though there may be a relationship between tax stimulus and capital investment, there has been no empirical verification of whether the change in investment was caused by the tax stimulus or if the investment would have been made during the relevant period of time in any case (16, p. 389).

Clearly it would be of enormous benefit to tax policy makers and to the public in general if the effectiveness of tax policy in the area of investment stimulus could become something more than a simple article of faith. The ITC was originally justified because there was a need for capital formation stimulus that could not be provided by final consumer demand alone. In a presentation to House and Senate committees in 1962 the Secretary of the Treasury
cited the need for help in a balance-of-payments problem, in the need to strengthen the recovery of the economy, and in achieving a higher rate of growth (17, p. 716). Similarly, the Revenue Act of 1978 included a change to the ITC as it applies to cooperative organizations on the justification that more capital investment would be generated if more tax credits were allowed (10, p. 256).

The situation of investment tax credits for cooperatives provides an opportunity to study ITC effectiveness that should yield more useful results than previous studies, not only because of the uniqueness of the ITC application in cooperatives, but also because farm cooperatives represent a clearly identifiable segment of the American economy. As such, the investment behavior can be studied in relation to factors that are more localized and more pertinent to these companies, as opposed to the use of national, macroeconomic influences that are used as variables in many tax research studies.

There is clearly only a single question being addressed in this study. That is, does the availability of the ITC have an effect on capital investment policies in farm supply cooperatives? This study addresses that question from more than one perspective, however, by examining the effect of the ITC not only on total investment, but also on the amount of capital expenditures that specifically qualify for the ITC.
Capital investment is feasible only if funds are available. In local farm cooperatives there is very little direct investment by the owners. The majority of owner investment occurs through retention of net profits in the cooperatives. The other primary source of funds is regular bank borrowing. Debt to equity ratios tend to run relatively high in farm cooperatives, as is evidenced by the financial data collected for this study, and as reported by other research. Since 1962 long term debt capitalization in cooperatives climbed from about twenty-nine per cent to forty-two per cent of total capital, and current liabilities moved from nineteen per cent to twenty-nine per cent of total capital (5, p. 76). Also, a Touche Ross study shows that in 1981, supply cooperatives had a net worth to assets-employed ratio of thirty-one per cent (2, p. 30).

Accordingly it can be surmised from the foregoing that capital spending in farm cooperatives is influenced by two prime factors. Those are (1) net income, especially the local net margins portion, and (2) the cost and availability of bank borrowing. Less important, but still significant, is the relative level of debt to equity. Other factors that are likely to influence capital investment behavior in farm cooperatives are general inflation and the general economic health of agriculture in the geographic area under study.

Intuitively one can conclude that capital investment will be high, relatively speaking, during periods of healthy
net income and low borrowing rates. Partialing out the effects of these and other factors that influence capital spending should reveal whether or not availability of the ITC is a significant factor in the determination of capital investment budgets, providing a comparison can be made with the capital investment activity that would prevail if there were either no ITC or a different amount of ITC available to the taxpayer. The 1978 change in the tax laws affecting cooperatives makes such a comparison possible if a reliable forecast can be made of investment activity that would have ensued had there been no change in the laws.

Given what seems to be widespread intuitive faith in the effectiveness of the ITC, it seems appropriate to hypothesize that the ITC does in fact make a difference in capital spending levels, even though convincing, empirical evidence to support that faith is lacking:

\[ H_0 \] Capital expenditures qualifying for the ITC in farm supply cooperatives are not significantly affected by availability of the ITC

\[ H_1 \] Capital expenditures qualifying for the ITC in farm supply cooperatives are positively affected (increased) by availability of the ITC
Limitations and Assumptions

One of the principal limitations of this dissertation study is a question of statistical soundness. The primary analytic technique employed in this study is that of time-series regression, and it is generally recognized that the results of time-series studies are likely to be questioned if an insufficient number of time periods are observed prior to the time of change intrusion. Ideally at least fifteen pre-change time periods would be included (13, p. 493).

It simply was not feasible, if not impossible, to collect the company-specific data for time periods earlier than 1975. The data is surely available at some location, but the effort required to collect the information is cost prohibitive, in terms of both time and money. The data collection effort was very costly to accomplish in any case, but was feasible for years 1975 and later.

The source for the company-specific data used in this study was the St. Paul, Minnesota Bank for Cooperatives. Beginning about 1975 that bank's research and analysis section began a process of pulling key financial figures together in a special summary format by individual year for each loan client. Collection of needed data for time periods prior to full implementation of that summary report would have required time and effort far in excess of what the researcher was able to commit.
Other limitations and assumptions need to be discussed. One of the principal questions that has been raised about the investment tax credit (ITC) is whether the credit has an effect on aggregate investment, or whether it has more of an effect on changing the composition of investment in its proportional make-up of property that is eligible for the ITC versus property that is not eligible. This study examines the behavior of investment in farm supply cooperatives for both aggregate capital expenditures and expenditures eligible for the ITC. Although hard, empirical data on total capital expenditures was collected for each and every cooperative included in the study, with no years missing, it was unfortunately not feasible to obtain sample data for 100 percent of the companies regarding expenditures that are eligible for the ITC. As will be more fully explained in Chapter III, data for ITC eligible investment was collected for about sixty percent of the companies in the sample, and in some cases for less than all of the years involved. Accordingly, conclusions reached in this study regarding the behavior of investment in property that is eligible for the ITC may be open to question.

An additional factor to consider in regard to possible limitations of the results of this study is the fact that no steps were taken to include in the model any specific variables that would represent the effect of external, irregular occurrences such as OPEC oil price shocks, highly unusual
weather patterns, or significant changes in federal agricultural laws or policies. Presumably such occurrences would have a noticeable effect on expenditures; however, as shown in Chapter III in the discussion of the methodology, independent variables were included in the model for general economic effects on agriculture of the geographic region under study, and hopefully the explanation that can be attributed to these general variables will include the effects of both the regular and irregular economic factors involved.

The extent to which the results of this study are generalizable is another item of contention. Not only does the study deal with only one type of business activity, that of farm supply cooperatives, but also the selection of the firms in the sample was partly judgmental rather than purely random. The exact steps employed in selecting the sample are described and explained in Chapter III. Nevertheless, the results should be generalizable to farm cooperative situations, and as a minimum, be useful in any deliberation of ITC effectiveness in general.

Finally, it should be stated that the basic premise of this study, as well as any other study of capital expenditure behavior, must include the assumption that businesses have a basic propensity to invest in additional plant and equipment, either directly in new facilities or indirectly by acquiring existing facilities. Only by so doing are the
managers of the company able to improve or expand their services. Presumably this pattern of investment behavior applies to farmers and farm cooperatives as well as to other businesses. As stated by Penson, Romain, and Hughes, "If in making investment decisions farmers maximize the present value of the equity, they would continue to add to existing stock of plant and equipment as long as present value of periodic net cash flows generated by an additional unit exceeds the net purchase price of the input." (14, p. 630).

There is no assurance, however, that such behavior will always prevail, either in cooperative or non-cooperative entities. There are obviously always many influences and differences in objectives. Cooperative businesses are likely to be heavily influenced by factors that are significantly different from those affecting the typical profit-seeking entity. These factors would include items such as assured sources of supply and limited return on investment, as discussed earlier in this chapter.

Also, it should be mentioned that tax legislation enacted in the years subsequent to the 1978 tax act is likely to have an impact on the investment behavior of American companies. Specifically, the Economic Recovery Tax Act of 1981 (ERTA) not only brought forth substantive change in the rules for the ITC, but just as significantly made drastic revisions in depreciation provisions by implementing the Accelerated Cost Recovery System (ACRS) of depreciation.
Further, tax provisions were generally liberalized with regard to capital expenditures, by permitting the sale of unneeded tax credits to other companies and allowing more imaginative leasing agreements. The effect of tax legislation of the following year, that of the Tax Equity and Fiscal Responsibility Act (TEFRA), was to take back from the taxpayer some of those benefits. In summary, the tax legislation of 1981 and 1982 not only implemented a great deal of change, but also resulted in widespread confusion and uncertainty among taxpayers in general. Especially confusing and controversial were the provisions of the law that dealt with leasing and the sale of tax credits. Whether or not managers were influenced in their decision-making during this time period of significant change, either to make investments they would not otherwise have made, or perhaps to make unsound decisions in regard to investments, is surely an unanswered question, and a possible influence that may distort the results of this study.

Chapter Descriptions

The purpose of Chapter I has been to introduce the study by examining the background not only of farm supply cooperatives but also of the investment tax credit (ITC). The history of the ITC as it applies to cooperatives is discussed, along with the need for empirical verification of the effectiveness of the ITC. Chapter I also provides a
discussion of limitations and assumptions inherent in the study, and concludes with this description of content of all the chapters.

Chapter II is devoted solely to a review of prior research that deals either with capital investment in general or with the effectiveness of the ITC. Chapter III presents a detailed discussion of the research methodology, including a description of data collection steps and procedures, identification and discussion of the variables included in the research models, and the statistical methods employed.

Chapter IV has the single purpose of presenting an analysis and interpretation of the results. Outputs of both research models are analyzed statistically, and various figures and tables of information are presented.

Finally, Chapter V includes a brief summary of the dissertation overall, puts forth an interpretation of the results of the study, and states conclusions. Recommendations for additional related research are also provided.
CHAPTER BIBLIOGRAPHY


CHAPTER II

PRIOR RESEARCH

Very little of the published literature dealing with the investment tax credit (ITC) has dealt head-on with the basic issue of whether or not the ITC is in and of itself an effective stimulant to capital investment. The few studies that have dealt specifically with ITC effectiveness have yielded conflicting results, and therefore have not resolved uncertainty about how responsive aggregate investment is to the ITC (1, p. 1).

Several studies have addressed peripheral issues, such as comparing effects of the ITC on investment with those of accelerated depreciation provisions, gauging effectiveness of ITC in large companies versus small companies, and whether financial reporting standards pertaining to the ITC have an effect on investment. The studies of all these associated issues have been based on the assumption that the ITC is inherently effective as an investment incentive.

This chapter discusses the results of the several studies that were examined in the process of preparing for this research project. The majority of the discussion is devoted to those studies that dealt with the central issue of ITC effectiveness.
Studies That Focused on the Central Issue
of ITC Effectiveness

The Hall and Jorgenson Study

The single study that has had the greatest impact in
the literature with regard to ITC effectiveness, at least in
terms of being most frequently referenced, is the effort
undertaken by Robert Hall and Dale Jorgenson in 1967. Hall
and Jorgenson concluded quite unequivocally that the ITC was
highly effective in influencing the level and timing of
investment (5, p. 413).

Hall and Jorgenson not only examined the effects of
the ITC, but also the effects of accelerated depreciation
provisions that were implemented in 1954, and the further
liberalization of depreciation through changes to shorten
estimated lives, implemented in 1962. They found all three
of these incentives to have significant effects on levels of
capital investment, but concluded that accelerated depreci-
ation had a substantial effect on investment in structures,
whereas the new depreciation range guidelines and the ITC,
both enacted in 1962, influenced a shift in investment from
structures back to equipment. Specifically in regard to the
ITC, Hall and Jorgenson stated in their conclusions that
"the effects of the ITC of 1962 are quite dramatic and leave
little room for doubt about the efficacy of tax policy in
influencing investment behavior." (5, p. 413).
The Hall and Jorgenson Study was based on the neoclassical theory of optimal capital accumulation (5, p. 392). From this theory they developed mathematical expressions that are based on the presumption that the firm will either accumulate assets in order to supply capital to itself, or will rent assets in order to obtain services. By applying this theory to macroeconomic data, Hall and Jorgenson, as mentioned earlier, concluded that tax incentives do indeed have great effects on levels of investment. However, none of the other researchers have found such profound relationships (4, p. 10). Further, there has been controversy regarding the applicability of the neoclassical model to this issue, thereby creating more uncertainty in regard to the usefulness of Hall and Jorgenson's study results (3, p. 316).

Machinery and Allied Products Institute (MAPI) and Other Field Studies

As indicated earlier, studies of ITC effectiveness that preceded and followed the Hall and Jorgenson study yielded conflicting results. However, some early studies performed by Machinery and Allied Products Institute (MAPI) reached the same conclusions as Hall and Jorgenson. A MAPI study published in 1963, barely one year after the ITC was initially implemented, indicated that much of the investment in eligible property, both past and proposed, could be attri-
buted to the ITC program, in that the ITC not only increased the supply of funds but also the incentive to invest the funds (7, p. 2).

On the other hand, field surveys conducted early on in the life of the ITC indicated that corporate managers conflicted in their opinions of effectiveness of the credit. While about one fourth of the corporations surveyed indicated they were influenced by the ITC in their decisions, most of the firms expressed concern about things such as the size of the credit, certainty of the benefits, and restrictions on utilization of the credit because only certain types of plant assets qualified and total dollar amounts of qualified expenditures in any single year were arbitrarily limited (4, p. 9).

The Woodard and Panichi Study

A Woodard and Panichi study completed in 1965 yielded results that did not support the conclusions of Hall and Jorgenson. While Woodard and Panichi agreed that investment spending had indeed proceeded at a high rate during the first two years the ITC was available, they concluded that the investment activity was not necessarily a result of the ITC. Conceding that the ITC may have had a mild influence on investment spending, they reasoned that the additional profits generated were not sufficient to provide the funds necessary to induce additional investment (12, p. 276).
The Johnson and Carey Study

A study that followed the Hall and Jorgenson work, completed by Johnson and Carey in 1970, focused only on the equipment replacement decision. Nevertheless, Johnson and Carey found the ITC to be ineffective at that time, stating that an ITC of seven per cent has relatively little effect on equipment replacement. However, they also concluded that an ITC higher than seven per cent would significantly influence the decision for new investment (6, p. 311).

Studies Reported in Unpublished Dissertations

Still another significant study that focused on ITC effectiveness per se was reported by Harold Wilson in his 1972 unpublished dissertation. Wilson concluded that the seven per cent ITC was not a significant incentive for manufacturing firms from 1962 to 1969, stating that the findings showed the ITC as failing to influence firms to invest in plant and equipment during periods when they would not otherwise have invested. This 1972 study conceded that the ITC might have influenced firms to increase the amount of investment they made, but the degree of influence was small when compared to other factors such as demand for growth, inflationary expectations, and existing capital conditions. Wilson based his conclusions on the fact that trends of gross plant and equipment accounts were not significantly altered by ITC introduction and suspension, and
that investment in plant and equipment as a proportion of sales dollars did not behave in any manner to indicate an increase in investment during periods of ITC availability (11, p. 178).

Another unpublished dissertation, completed in 1976 by Robert Gustavson, found that depending on the state of the economy an incentive such as the ITC does affect the level of capital investment. However, ITC effectiveness per se was not Gustavson’s main topic. His principal findings were that a permanent investment credit was neither necessary nor desirable, and that a discretionary ITC would be appropriate during specific phases of economic cycles (4, p. 245).

The Aaron, Russek, and Singer Study

Noting that previous studies had not resolved uncertainties about the effectiveness of tax incentives, Aaron, Russek, and Singer in 1972 studied the effects of recent tax changes on the composition of capital investment if aggregate investment is unchanged. They concluded that the ITC does indeed have an impact on investment composition, stating that removal of ITC provisions in 1969 caused a significant reduction in equipment investment, and that reinstatement of the ITC in 1971 had the opposite effect of causing investment to flow away from structures back into equipment (1, p. 13).
Studies That Focused on Peripheral Issues

As indicated earlier, several studies have addressed some issues associated with the ITC. For example, in June 1973 Sunley was critical of the ITC's lack of neutrality. Sunley made several suggestions for making the ITC neutral, such as requiring a basis adjustment and repealing recapture provisions (10, p. 218). Also, in 1976 Parker and Zieha attempted to determine whether the tax incentives were compensating for inflation losses from historical cost accounting. They concluded that the increase in ITC from seven to ten per cent was insufficient to offset recent levels of inflation (8, p. 189).

Finally, two additional unpublished dissertations are noteworthy. In 1971 William Stephens examined the response of investment practices to tax incentives, specifically small manufacturers versus large manufacturers. Stephens hypothesized that the effect of incentives would be greater in larger firms, but his study showed the opposite results (9, p. 108). Also, in 1975 Jerry Arnold studied the financial reporting impact of the ITC, reasoning that companies would have less motivation to invest if the impact of the tax savings was not reflected in the bottom line immediately. This study related to the well-known controversy of whether the tax reduction effects of the ITC should be deferred in the financial statements, that is, viewing the ITC as a reduction of cost and handling it as a reduction of
basis, or whether it should be fully reflected as a one-time reduction of income tax expense in the year of investment in the same manner as reported in the tax return. Arnold's study yielded inconclusive results, but did reject the notion of self-evident effects on management of alternative accounting principles (2, p. 9).

Summary

The Hall and Jorgenson study was the most popular study of investment tax credit effectiveness, and from that study the researchers concluded that the availability of the credit does affect the level of capital investment. The Hall and Jorgenson study was part of a flurry of activity that appeared in the economic literature during the middle and late 1960s. Unfortunately the conclusions of Hall and Jorgenson have never been satisfactorily corroborated, but instead there has been a significant amount of criticism of their approach, as well as studies by other researchers reaching different conclusions.

Given the foregoing, the existing literature is not very helpful for the purposes of developing hypotheses and research models for additional study of the investment tax credit. The problems encountered by previous researchers are indicative of the difficulty involved in adequately specifying the relevant variables for a research model that attempts to answer directly the question of whether the
credit does or does not meet its legislated objective of stimulating economic growth by causing increased expenditures.
CHAPTER BIBLIOGRAPHY


CHAPTER II

RESEARCH METHODOLOGY

As indicated in Chapter I, this dissertation is an empirical study of farm supply cooperatives, focusing specifically on the level of capital expenditures, and whether such expenditures are affected by the availability of the investment tax credit. The purpose of this chapter is to describe in detail the process of gathering the raw data, and to explain the statistical procedures employed to analyze the data.

The Data

The majority of the financial operating information needed for this study was extracted from the files of the St. Paul, Minnesota Bank for Cooperatives. The primary source within the St. Paul bank was the individual loan application and maintenance folder that the bank maintains for each cooperative client. Those files contain official, audited financial statements and other data, including the levels of capital expenditures, for each of the years that a particular farm supply cooperative is a borrower or has a line of credit approved by the bank. For years prior to 1975 the files lack items of information vital to this study; therefore, no information was gathered for any year.
prior to 1975. Further, at the time the information was being collected, financial data for 1984 had not yet been received and posted in the bank files. Accordingly, only the years 1975 through 1983 have been included in this study. For reasons of privacy, it was agreed that once the data was collected there would be no further connection or reference to any specific farm supply cooperative.

Gathering of pertinent data for this study involved several steps, the first of which was to select a sample of about 100 farm supply cooperatives. The sample was derived from a total population of about 460 cooperatives, comprising both farm supply-general and farm supply-petroleum types of operators. These two categories of operations are among several different classifications of farm cooperative functions developed by the St. Paul, Minnesota Bank for Cooperatives, and are based on various quantitative and qualitative factors, the most significant being the dominant revenue source. Other principal classifications are grain-marketing, dairy, fruit and vegetable, and electricity. However, the vast majority of cooperatives that deal with the St. Paul bank are either grain-marketing or farm supply. In excess of fifty per cent of the St. Paul bank borrowers are of the farm supply categories.

The selection of 100 farm supply cooperatives for this study involved sizing the sample by geographical area. There are four contiguous states in the region served by the
St. Paul bank for Cooperatives: Michigan, Minnesota, North Dakota, and Wisconsin. Sampling distribution was made proportionate to the relative number of borrowers in an individual state compared to the total number of borrowers of all four states. Specifically, numbers of borrowers from each state were derived as shown in the following schedule:

Borrowers classified as "farm supply-general": 331
Borrowers classified as "farm supply-petroleum": 128
Total farm supply cooperatives listed: 459

\[
\begin{align*}
331/459 &= 72\text{ per cent} \\
128/459 &= 28\text{ per cent}
\end{align*}
\]

<table>
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<th>Geog. area</th>
<th>Actual No. of borrowers</th>
<th>Relative pct of 28&amp;72</th>
<th>Sample size</th>
<th>No. by type</th>
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100 Total

The St. Paul Bank for Cooperatives keeps the files for their borrowers segregated by individual state. In other
words the Michigan borrowers are located in cabinets separate from the Minnesota borrowers and so forth. Accordingly it became feasible to choose the sample size for each individual area by choosing an alphabetical starting point and making file selections until the desired sample size was reached. For this study the starting point selected was the beginning of each file segment, that is, those that were filed alphabetically under the letter "a." However, file folders that did not contain data for the continuous period of 1975 through 1983 were not selected. Neither was there a selection of any file in which there was any indication of a change in fiscal year-end during the period under study.

In addition to collecting the basic financial data from the files of the St. Paul Bank for Cooperatives, information regarding the portions of capital expenditures eligible for the ITC was collected on sixty of the one hundred farm supply cooperatives in the sample, but in some cases for less than all the years included in the study. Information on expenditures eligible for the ITC is income tax return data rather than general financial statement data, and was not available in the files of the St. Paul bank. Therefore, the income tax information had to be collected from files of independent auditors, making it impractical, if not impossible, to collect such information for the entire sample. Fortunately, one of the research staff of the St. Paul bank was able and willing to visit two auditing companies that
specialize in auditing farm cooperatives and personally collect the needed investment tax credit information. The collection of this extra data was possible only because the bank researcher had a working relationship with the managers of those auditing companies. The auditors were assured that all information would be kept confidential with regard to any specific cooperative.

This special data collection effort was even more successful than had been anticipated. Sixty percent of the farm cooperatives that make up the sample for this dissertation research study were clients of the two auditing firms that agreed to participate. However, given that in some cases the cooperatives were clients of the auditing firms for less than the nine years included in this study, only 466 of 936 possible data points were available and collected in the sub-sample. This represented almost exactly fifty percent of the total. By extrapolating from the sub-sample, representative amounts of "capital expenditures qualifying for the ITC" were computed as necessary to complete the data needed for the study. More specifically, the aggregate of the capital expenditures qualifying for the ITC for the 466 data points collected in the sub-sample discussed above was $30,439,000. The aggregate of the 466 corresponding total capital expenditures data points (i.e., same years and same cooperatives) was $38,304,000. In those aggregates the capital expenditures qualifying for the ITC are 79.5 percent
of the total capital expenditures. Accordingly, the amount of capital expenditures qualifying for the ITC, wherever missing, was inserted at 79.5 percent of the corresponding total capital expenditures.

Remaining data required for this study was available in academic libraries. First, general agricultural economic data was collected for the four states represented in the sample. This included (1) cash receipts from farming, and (2) total dollar amount of loans made by banks for cooperatives. All of this historical data is routinely compiled by the Department of Agriculture Statistical Service, and is developed for each individual state of the union. Analysis of such data was expected to reveal the general economic climate of the agricultural sector under study, and be an appropriate measure of the capacity of the farm cooperatives to make capital expenditures during the period of time under study.

In addition, data was needed to represent the impact of general inflation in agriculture, and the effects of money interest rates on agricultural borrowers. The farm products component of the Producer Price Index was selected as an appropriate measure of the impact of inflation, whereas the nominal interest rate behavior was examined by collecting data on the interest rates charged on loans made by banks for cooperatives. Agricultural cooperatives do about two thirds of their borrowing through the farm credit system
The interest rate and inflation effects were combined into a single independent variable of "interest rate minus inflation factor."

Analytic Procedures

The analytical steps performed on the collected data included (1) a determination of the basic distributional characteristics of each variable by computing various descriptive statistics, (2) an analysis of a sub-sample of the data to test for the effects of auto-correlation, and (3) a pooled time-series and cross-sectional analysis of the data for each year to determine the relationship between the variables. Included in the models for step (3) were a dummy variable "0" for pre-change (prior to the law change) years and a dummy variable "1" for post-change years.

Model Development

Existing literature that relates to capital budgeting provides very little discussion of the determinants of a company's overall capital expenditures. Instead, much of the research investigates variables that are involved with making a particular, individual investment. Such variables normally include length and life of asset, expected net receipts, tax and interest rates, and of course the cost of acquiring the asset. The ITC is included in the research models as a reduction of asset acquisition cost.
In these common investment models the manager compares the present value of a stream of anticipated cash receipts with the net acquisition cost, and from the quantitative aspects of his decision will choose a project that has favorable net present value or internal rate of return as compared to cost of capital (2, p. 336).

Developing a model for the study of investment credit effects on overall capital investment in farm supply cooperatives as a group is more difficult. Information regarding individual projects is not available. Neither is information available on the employed modes of capital investment decision-making. In this study it became necessary to identify those variables that plausibly affect capital expenditure decisions in general. By assuming that capital investment levels will change in relation to the changes in such variables, it was postulated that the research model used in this study would indicate the changes in capital investment patterns that are likely to result from any change in one of the elements of a common investment model. A different level of ITC available would be such a change in that the ITC results in a reduction in acquisition cost.

The literature on capital investment models indicates that expected future demand is a prime determinant of capital expenditures (4, p. 364). Not surprisingly it has been shown that expected changes in sales over a significant future period is positively related to capital expenditure
levels (4, p. 386). Unfortunately, information relating to expected future sales is not available for the farm supply cooperatives under study in this dissertation project; therefore, other determinants had to be used.

The key variable in the econometric model of the Hall and Jorgenson study, mentioned earlier in this proposal, was output of the firm (7). Hall and Jorgenson sought to measure net investment as a function of changes in desired capital. They saw price and quantity of output, scaled by the rental price of capital, as a prime determinant of changes in desired capital. However, their use of output in the model was severely criticized by other econometricians, primarily because output was deemed to be a decision variable (3, p. 370).

In any case it was not feasible to include an output variable in this particular study. While information is available on output of the cooperatives, such as sales and cost of goods sold, there is no practical means of relating such variables to the capacity of the firm; therefore, inclusion of an output variable cannot be supported.

Other important determinants of investment are availability of funds and company profitability (6, p. 9). While variables such as output and expected future demand may have good support theoretically as being valid determinants of investment, availability of funds and profitability are more easily measured, have practical appeal, and are very
plausible from an intuitive standpoint. Funds availability is a key element in any spending decision, whether the funds are generated internally or by increased borrowing and investment. Also, it has been shown empirically that firms tend to increase their capital expenditures when they are profitable, although it is not clear whether profitability increases the overall average level of expenditures or merely affects the timing of such expenditures (4, p. 386).

In this study the availability of funds was gauged by the behavior of borrowing rates charged by banks for cooperatives. As indicated earlier the research model includes the farm products component of the Producer Price Index as part of a combined inflation and interest rate variable. Borrowing is a prime source of funds in farm cooperatives. Additional outside owner investment is generally not a prime source of funds, except perhaps during start-up or for major expansion.

Also, the propensity for farm cooperatives to invest in additional facilities should be measurable to some extent by examining the general economic health of the agricultural sector. Including general economic variables in the model takes into consideration the changes in investment that would have occurred simply in light of changes in the general economic situation.

Finally, it is assumed that general profitability is an appropriate determinant of investment in cooperatives. Even
though operating at cost is one of the cooperative underpinnings, cooperative members will demand that the business strives to achieve a certain level of profit. Positive income is necessary, especially in the long run, so that the members can look forward to eventual return of their investment through a system commonly known in cooperatives as revolvement. Further, a 1974 study found a reduced dependence on tax exemption for cooperatives, and that cooperatives in general were moving towards profit-maximizing behavior (8, p. 106).

The statistical model for analysis of the sample data was developed from the standard multiple regression formula. A separate model is stated for each of two independent variables: (1) the level of capital investment eligible for ITC, and (2) the residual of total capital investment regressed on the level of eligible capital investment.

Because of the significant size variance encountered among the 100 cooperatives in the sample it was deemed appropriate to scale the company-specific variables by a size variable. The total asset base was chosen for this purpose, and it is expected that this will result in a more meaningful analysis of generalized capital investment behavior.

Following is a listing of the two models used in this study, along with an explanation of the individual elements of the models:
MODEL 1

\[ Y = a + b_{1} (IR-IF) + b_{2} NM + b_{3} LM + b_{4} DA \]
\[ + b_{5} EH1 + b_{6} EH2 + b_{7} ITC + b_{8} ITC(IR-IF) \]
\[ + b_{9} ITC(NM) + b_{10} ITC(LM) + b_{11} ITC(DA) \]
\[ + b_{12} ITC(EH1) + b_{13} ITC(EH2) + b_{14} TND + e \]

where,

\[ Y = \text{capital investment eligible for ITC, scaled by total assets} \]
\[ a = \text{autonomous level of capital investment eligible for ITC not explained by variables or residuals} \]
\[ IR-IF = \text{net effect of interest and inflation, shown as difference between rates charged on loans made by banks for cooperatives, and an inflation index represented by the farm products component of the Producer Price Index (PPI)} \]
\[ NM = \text{net margins (net income), scaled by total assets} \]
\[ LM = \text{local net margins, representative of income before addition of patronage dividends received from affiliates, scaled by total assets} \]
\[ DA = \text{debt to assets ratio} \]
\[ EH1 = \text{cash receipts from farming, aggregated for the four states represented in the study} \]
\[ EH2 = \text{total dollar amount of loans made by banks for cooperatives, aggregated for the four states represented in the study} \]
\[ ITC = \text{dummy variable; 0 if pre-change, 1 if post-change} \]
\[ ITC(IR-IF) = \text{dummy variable multiplied by interest/inflation factor} \]
\[ ITC(NM) = \text{dummy variable multiplied by net margins} \]
\[ ITC(LM) = \text{dummy variable multiplied by local net margins} \]
ITC(DA) = dummy variable multiplied by debt to assets ratio
ITC(EH1) = dummy variable multiplied by economic indicator of cash receipts from farming
ITC(EH2) = dummy variable multiplied by economic indicator of loans made by banks for cooperatives
TND = trend variable
e = residual

MODEL 2

\[ Y = a + (\text{same as for MODEL 1}) \]

where,

\[ Y = \text{a saved residual, in which total capital expenditures were regressed on the capital expenditures eligible for ITC} \]

\[ a = \text{portion of the saved residual not explained by any of the independent variables or residual} \]

The following paragraphs provide a discussion of the effects on the dependent variables expected from each of the independent variables. First, it is important to keep in mind that the capital expenditures that qualify for the investment tax credit are always a part of total capital expenditures. Accordingly, it was deemed appropriate to develop a second model for which the dependent variable is a saved residual that represents only those capital expenditures that do not qualify for the ITC. This saved residual, representing dependent variable \( Y \) in Model 2, was developed by regressing the total capital expenditure values on the reported capital expenditures that are eligible for the ITC,
producing a residual variable from which all the effects of capital expenditures eligible for ITC have been partialled. Using this saved residual as the dependent variable in MODEL 2 presents the opportunity to analyze the effects that the independent variables have on the capital expenditures that are not eligible for the ITC.

The principal model in this dissertation, however, is MODEL 1. The remaining paragraphs of this chapter are devoted to a discussion of the main effects independent variables. The independent variables in MODEL 2 are identical to those used in MODEL 1.

First, in regard to variable IR-IF, it seems plausible that an inflation-adjusted borrowing rate will vary inversely with the level of capital expenditures. Presumably the managers and board members of the farm cooperatives will be averse to additional borrowing whenever the real cost of money is relatively high. Given that a large portion of capital expenditures are financed with borrowed funds, especially in farm cooperatives, as the inflation-adjusted interest rate rises, the level of capital expenditures should fall.

It can be argued, however, that the management decision regarding capital expenditures may be affected by perceived or anticipated changes in the real cost of borrowing. That is, capital expenditures may be made during periods of high borrowing costs because management expects those costs to be
even higher in the near-term. If management does behave in that fashion, and then the future costs of borrowing do not rise as had been anticipated, analysis of the historical data would result in misleading interpretations. Although it is recognized that such could be the case, in this study it is presumed that in general the decision-making behavior would be as postulated above; that is, levels of capital expenditures will fall as borrowing costs rise, and vice versa.

The next independent variable shown in the model is net margins (NM). This is a commonly used title for bottom line income in cooperatives. Although there is some disparity in reporting practices, in general the net margin figure is comparable to net income as reported by regular corporations, that is, the profit that remains after revenues have been reduced by all expenses of the period, including income taxes.

However, a key component of bottom line income in a cooperative is the amount of patronage dividends distributions received from other cooperatives with whom business has been done during a preceding year. Farm cooperatives receive such distributions from the regional and inter-regional cooperatives with whom they are affiliated. Hence, the bottom line income in a farm cooperative can be expected to be significantly greater in amount than the operating income (local margin).
In the context of this dissertation, it is appropriate to discuss the impact on capital investment decisions of these patronage dividends that are received. At least twenty per cent of the total amount of these dividends are received in cash, in that the tax code requires a minimum of twenty per cent cash distribution in order for the dividend to qualify as an income tax deduction for the distributor. Seldom is the cash portion more than forty per cent of the total. More often the payout is the twenty per cent minimum required by law. The non-cash portion is recorded by the farm cooperative as an investment in the regional or inter-regional cooperative from which the dividend is received. Nevertheless, given the significant cash flows expected from the patronage dividends received, it seems plausible to expect the relative amounts of the patronage dividends to have an influence on the capital expenditure decision.

A key indicator of capital investment behavior in a cooperative should be the level of operating income. In cooperatives this is generally known as "local margin." Local margins have been included in this research model as the third independent variable.

Without a favorable operating margin there is little likelihood that management will be able to justify the need for additional capital investment when the expenditure plans are presented to cooperative board members and to creditors, regardless of whether the plans are for replacement or
expansion. A positive local margin indicates that existing debt is being serviced from operations. Also, given that local margin is income remaining after the subtraction of depreciation and amortization of long term assets, a positive local margin indicates a positive net cash flow generally in excess of asset replacement needs. As discussed earlier, firms tend to increase capital expenditures when the firm is profitable. The local margin is a key indicator of profitability, and can be expected to be positively correlated with the level of capital expenditures.

Included as the fourth independent variable in the research model of this study is the total debt to total assets (D/A) ratio. The D/A ratio is one of the most significant measurements of any corporation, but is especially important in farm cooperatives in that, as mentioned earlier, farm cooperatives tend to have relatively high D/A ratios (1, p. 13).

Capital expenditure levels and D/A ratios most often are inversely related; as the D/A ratio increases, the level of capital expenditures would be expected to decrease. With high D/A situations, managers will find it difficult to service existing debt and, in cooperatives, there is the additional need for cash to fund the equity revolvement of the cooperative members. For these reasons, creditors are reluctant to increase their exposure and will therefore be averse to extend additional loans that are needed for
capital expenditures. However, given that in cooperatives the preponderance of funding for capital expenditures comes from debt sources, when one looks at the behavior of capital expenditures for any given year in terms of increase or decrease over the levels of a previous year it is plausible to assume that, as the levels of expenditures rise the debt to asset ratio will also rise, and vice versa. Hence, it is assumed for this study that D/A ratio and the level of capital expenditures are positively correlated.

Other than the dummy variable, the remaining independent variables in the research model are two general economic indicators that are expected to correlate positively with the level of capital expenditures. Farm cooperatives are directed by board members who are themselves actively engaged in farming. Whenever farm income is at favorable levels in comparison to previous periods, farm operators are generally in a spending frame of mind in regard to expansion and replacement of their facilities. Farm cooperative operating results can be expected to be favorable any time farm operations in general are turning in favorable results. Inclusion of this variable in the model is expected to account for some of the normal increases and decreases in capital expenditures that result from the cyclical ups and downs of the farm economy.

Similarly, it is expected that the loan volume of banks for cooperatives will correlate positively with capital
expenditures in farm cooperatives. These banks make loans only to cooperatives, and while it is true that the loans are made both for working capital purposes as well as for long term needs, in general the capital expenditures of a cooperative should rise when loan volume rises and vice versa.

An example of the collected data that is used to form the company-specific variables is shown in Table I. The data in Table I represents only one of the 104 farm supply cooperatives that were sampled. It was chosen randomly for this table.

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Capital Expends.</th>
<th>Capital Expends. Elig. ITC</th>
<th>Total Assets</th>
<th>Total Debt</th>
<th>Local Margin</th>
<th>Net Margin</th>
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<td>75</td>
<td>10</td>
<td>10</td>
<td>884</td>
<td>256</td>
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<td>44</td>
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<td>32</td>
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<td>5</td>
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<td>74</td>
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<tr>
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<tr>
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<td>107</td>
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<td>9</td>
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<td>70</td>
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<tr>
<td>83</td>
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<td>10</td>
<td>1,770</td>
<td>905</td>
<td>-5</td>
<td>13</td>
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</table>
Data for the economic variables used in the research models was extracted from published statistics of the U. S. Department of Agriculture. Those data are shown in Table II.

### TABLE II

**ECONOMIC VARIABLES**

<table>
<thead>
<tr>
<th>Year (1)</th>
<th>Average Interest Charged by Banks for Cooperatives (2)</th>
<th>Producer Price Index (PPI), Farm Products (3)</th>
<th>Farm Income* (4)</th>
<th>Banks for Cooperatives Loan Volume* (5)</th>
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<tr>
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<td>12,277</td>
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<td>78</td>
<td>8.75</td>
<td>212.5</td>
<td>13,022</td>
<td>14,125</td>
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<tr>
<td>79</td>
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<td>249.4</td>
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<td>17,173</td>
<td>29,214</td>
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*Amounts in millions of dollars
CHAPTER BIBLIOGRAPHY


CHAPTER IV

RESULTS OF THE STUDY

The purpose of this chapter is to analyze, interpret, and present the results of running the statistical models described in Chapter III, and to present descriptive statistics and other information that is pertinent to the understanding of the study results. The primary focus, however, will be on the results of MODEL 1, in which the dependent variable is the level of capital expenditures that are eligible for the investment tax credit, and the independent variables are (1) prevailing interest rates less a measure of inflation, (2) the level of operating income, (3) the bottom line net income, (4) the debt to asset ratio, (5) aggregate farm income for the four states in which the sampled entities are located, (6) total volume in dollars of loans made by banks for cooperatives, (7) a dummy variable, appearing as "0" for years before the tax law was changed and as "1" after the law change, (8) a series of interactive variables combining the dummy variable with each of the main effects independent variables, and finally (9) a trend variable that takes the value of "1" in year one, the value of "2" in year two, etc. All the variables are described in detail, with the model in equation form, in Chapter III.
MODEL 1 Results

Main-Effects Variables

As hypothesized in Chapter I of this study, capital expenditure levels in farm supply cooperatives should respond positively to availability of the investment tax credit whenever the expenditures qualify as being eligible for such credit. Accordingly it would be expected that entering the dummy variable in the MODEL 1 hierarchical regression analysis would provide results that are statistically significant, and that show positive correlation. However, such is not the case. As shown in TABLE III, the simultaneous t-ratio of -.058 for the dummy variable is not only confounding in that it indicates a negative relationship between capital expenditures eligible for the investment tax credit and the availability of that credit, but also the low absolute value of the t-ratio indicates that the dummy variable is not significant at the 0.05 level.

As indicated by the relatively low coefficient of determination of .1058 given by MODEL 1, the independent variables specified for this research model explain only about ten and one half percent of the variance in the level of capital expenditures eligible for the investment tax credit. This indicates the possibility of specification error in the model.
Of the independent variables in the model, the majority of the explanatory power is contained in the debt/asset ratio ($t = 6.713$). Also, the positive relationship between the direction of the debt/asset ratio variable and the independent variable is a plausible relationship as discussed earlier. Given that the primary source of funding in farm cooperatives tends to be bank borrowing, the debt/asset ratio should move in the same direction as the level of capital expenditures. As shown in Table V, at $T = 0.190$ the debt/asset variable correlates more highly with the dependent variable than any of the other independent variables.

Both of the two remaining company-specific main-effects variables, those being the local margin and the net margin, are positively correlated with the dependent variable. However, at $t = 0.598$ and $t = 1.232$ respectively, neither of those variables are statistically significant at the 0.05 level. Again, this positive correlation is in accordance with the expectation that higher income tends to result in a higher level of capital expenditures.

The trend variable is significant and negatively correlated with the dependent variable ($t = -2.020$). However, none of the economic variables are significant at the 0.05 level, either as main-effects or as interactive variables. Also, as shown in column 15 of Table V, all of the economic variables are negatively correlated with the dependent variable. A negative correlation was expected for the interest
rate/inflation factor variable, but not for the loan volume or the farm income variables.

**TABLE III**

**SUMMARY OF MODEL 1 RESULTS**

Simultaneous Values

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<td>-0.061</td>
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<td>0.0044</td>
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<td>*DEBT/ASSET</td>
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<td>0.3923</td>
<td>0.0466</td>
<td>6.713</td>
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<td>LOCALMARGIN</td>
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</table>

\[ F \ = \ 7.7862 \]

\[ MR = 0.1058 \]

*Significant at 0.05 level
TABLE IV

SUMMARY OF MODEL 1 RESULTS

Incremental Values

Dependent Variable: Capital Expenditures Eligible for ITC

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</thead>
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<td>.375</td>
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<td>.0066</td>
<td>-2.512</td>
</tr>
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<td>*LOCMARGIN</td>
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<td>.0157</td>
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<td>NETMARGIN</td>
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<td>.0001</td>
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<td>.0558</td>
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<td>.617</td>
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<td>.0000</td>
<td>.024</td>
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<td>*DUMDEBT/ASSET</td>
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<td>.0088</td>
<td>-2.996</td>
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<td>.0165</td>
<td>.0001</td>
<td>.274</td>
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<td>-.2021</td>
<td>-.3231</td>
<td>.0067</td>
<td>-2.628</td>
</tr>
</tbody>
</table>

F = 7.7862

*Significant at 0.05 level

MR = .1058
Interaction Variables

Three of the interaction variables indicate significance, those being the three company-specific variables of debt/asset ratio, local margin, and net margin, when combined with the dummy variable (t = -2.909, t = 2.357, t = -2.628 respectively). Two of those interaction variables, debt/asset ratio and net margin, have relatively high incremental t-values (see Table IV), and carry unanticipated negative signs. This indicates that the behavior of the main-effects variables may be conditioned by the effects of the interaction in that the interactive effects will always override the main effects. These interactive effects were computed and are graphed in Figures 1 and 2.

As the graph of Figure 1 shows, although there is a corresponding rise in the level of capital expenditures (plotted on the vertical axis) as the debt/asset ratio rises (horizontal axis), the level of capital expenditures is lower after the investment credit is available than it was when no credit was available. Further, the plotted line is steeper for the period prior to the law change that made the investment credit available than it is for the period after the law change. These patterns are inconsistent with expectations, in that the level of capital investment is not really expected to accelerate in relation to a rise in the debt/asset ratio, but if it were to accelerate it would
FIGURE 1
INTERACTIVE EFFECTS
Debt/Asset Ratio

Investment Credit NOT Available

* (Investment Credit Available)
FIGURE 2
INTERACTIVE EFFECTS

Net Margin

Investment

0.20

0.18

0.16

0.14

0.12

0.10

0.08

0.06

0.04

0.02

0.00

LOW MEDIUM HIGH Net Mgn

* (Investment Credit NOT Available)

* (Investment Credit Available)
be more likely to do so when an investment tax credit is available rather than when no credit is available. Nevertheless, the results of this data analysis indicate that the main effects of the D/A variable are conditioned by the fact that the rate of investment before the ITC availability was not only proportionately greater but also more sensitive to changes in the D/A ratio than after the ITC became available to the cooperatives.

The results of the net margin variable interacting with the dummy variable also differ from expectations. Again, as shown in Figure 2 the level of capital expenditures is higher when no investment tax credit was available than it is after the credit became available. Further, there is inconsistency in the direction of the change. Capital expenditures correlate positively with net margins before the investment tax credit is available, but negatively after the credit is available. As with the D/A ratio, the effects of the net margin are conditioned by the behavior of the variable before the intrusion date.

**Inter-Relationship Between Variables**

As to inter-relationships between the variables, a correlation matrix is presented as Table V. As the information in that matrix indicates, the dummy variable and the three economic variables (interest/inflation, loan volume, farm income) are all very highly correlated; however, none
of them are highly correlated with any of the company-specific variables (debt/asset ratio, local margin, net margin).

On the other hand there is very little correlation in regard to the company-specific variables, except of course between local margin and the net margin. Also, as indicated earlier there is not a great deal of correlation with the dependent variable by any of the independent variables. Those relationships are shown in column 15 of Table V.

MODEL 2 Results

The results of MODEL 2 are shown in Tables VI and VII. In MODEL 2 the independent variables are identical to those used in MODEL 1, but the dependent variable is the saved residual produced from regressing total capital expenditures on the level of capital expenditures eligible for the investment tax credit. As hypothesized when designing the research models, the expected results of MODEL 2 are that capital expenditures that are not eligible for an investment tax credit should not be affected by the availability of such a credit. As shown in Table VI, where the dummy variable is not significant (t = .0041), this hypothesis is supported by the statistical analysis. Although none of the simultaneous t-values are significant in the results of MODEL 2, the pattern of the t-values is similar to that of
<table>
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<tr>
<th>Ln/Rw Item</th>
<th>INTINF</th>
<th>LOANVL</th>
<th>FARMINC</th>
<th>TRENDVR</th>
<th>DEBT/ASSET</th>
<th>LOCASSET</th>
<th>MGN</th>
<th>NETMGN</th>
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<td>-.011</td>
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<td>.009</td>
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<td>(12)</td>
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<td>-.011</td>
<td>-.008</td>
<td>.010</td>
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<td>.126</td>
<td>.098</td>
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<tr>
<td>(13)</td>
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<td>-.027</td>
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<td>-.009</td>
<td>-.004</td>
<td>.098</td>
<td>-.005</td>
<td>1.000</td>
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TABLE VI
SUMMARY OF MODEL 2 RESULTS

Simultaneous Values

Dependent Variable: Saved Residual of Regressing Total Capital Expenditures on the Level of Expenditures Eligible for Investment Tax Credit

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<th></th>
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<td>LOANVOL</td>
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<td>DEBT/ASSET</td>
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<td>CONSTANT</td>
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</table>

\[ F = 1.1734 \]
\[ MR = .0175 \]
### TABLE VII

**SUMMARY OF MODEL 2 RESULTS**

**Incremental Values**

Dependent Variable: Saved Residual of Regressing Total Capital Expenditures on the Level of Expenditures Eligible for Investment Tax Credit

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>Increm. B (1)</th>
<th>Increm. Beta (2)</th>
<th>Increm. R2 (3)</th>
<th>Increm. t (4)</th>
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<td>INTINFLA</td>
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<td>.0185</td>
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<td>LOANVOL</td>
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<td>DUMNETMGN</td>
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<td>-.478</td>
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</table>

\[ F = 1.1734 \]

\[ MR = .0175 \]
MODEL 1 for the main-effects variables, with the debt/asset ratio having the highest t-value of those variables ($t = 1.501$).

Auto-Correlation

As with any time-series analysis study, the subject of auto-correlation needs to be addressed. Most time-series data are auto-correlated, and ideally this study would include steps to test and correct for that problem. However, as discussed in Chapter I, one of the principal weaknesses of this particular study is that there are too few years of observations before the intrusion of the change in the income tax law affecting the investment tax credit. As a result, the procedures necessary to correct for auto-correlation would reduce the degrees of freedom to the point that analysis of the data would be meaningless. Accordingly, the auto-correlation in the data for this study must be accepted as a qualification to the findings.

General Statistics

This concludes the analysis of the statistical procedures applied in this study. The general statistics of the data are presented in Table VIII. All of the means shown for the data appear to be plausible. The debt/asset ratio mean of .366, although quite high in a general economic sense, is not as high as indicated in some of the literature on cooperatives. However, the maximum debt/asset ratio
recorded is .98, a rather high ratio. Also, the standard deviation of .16 indicates that ninety-five percent of these ratios would fall between .206 and .526, a quite broad range.

TABLE VIII
SUMMARY OF DESCRIPTIVE STATISTICS

<table>
<thead>
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<th>Variable</th>
<th>n</th>
<th>Mean</th>
<th>Std. Dev.</th>
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<tr>
<td>Capital Expenditures in Total*</td>
<td>936</td>
<td>0.046</td>
<td>0.044</td>
</tr>
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<td>Capital Expenditures</td>
<td>936</td>
<td>0.035</td>
<td>0.033</td>
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<tr>
<td>Eligible for ITC*</td>
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<td></td>
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</tr>
<tr>
<td>Debt/Asset Ratio</td>
<td>936</td>
<td>0.366</td>
<td>0.160</td>
</tr>
<tr>
<td>Local Margin*</td>
<td>936</td>
<td>0.038</td>
<td>0.052</td>
</tr>
<tr>
<td>Net Margin*</td>
<td>936</td>
<td>0.038</td>
<td>0.052</td>
</tr>
<tr>
<td>Interest Rate less the Inflation Factor</td>
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<td>0.077</td>
<td>0.055</td>
</tr>
<tr>
<td>Farm Income</td>
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<td>@3,075.424</td>
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<tr>
<td>Loan Volume</td>
<td>9</td>
<td>@18,536.119</td>
<td>@6,895.670</td>
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</table>

*Scaled by Total Assets
@Amounts in Millions
CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The purpose of the study in this dissertation was to shed more light on whether the investment tax credit is effective in its presumed objective of stimulating the national economy by causing an increase in the level of capital investment. Results of previous studies have been conflicting and inconclusive. The study in this dissertation became feasible because of an opportunity to examine the behavior of capital expenditures in farm supply cooperatives, which represent a well-defined, yet sizeable segment of the nation's businesses. The opportunity arose when it was learned that certain financial operating statistics regarding farm cooperative borrowers were available at the St. Paul, Minnesota Bank for Cooperatives. Further, in the Revenue Tax Act of 1978, Congress amended the investment tax credit provisions that specifically affect cooperatives. Accordingly, this study examines capital expenditure behavior in farm cooperatives for a period of years both before and after the 1978 tax-change intrusion. Also, the study is based on hard, reliable empirical data.
In Chapter I of this dissertation, the background of farm cooperatives is discussed, especially in regard to how they have been affected by federal income taxes. Following that discussion, the origin and background of the investment tax credit in the United States is examined. The background section of Chapter I concludes with a discussion of the impact of the investment tax credit on farm cooperatives, both historically as well as under current law.

Prior to 1962, cooperatives were generally exempt from federal taxation. The exemption was usually justified on the general theory that cooperatives are formed primarily to assure market outlets for their products, and to provide reliable sources of supply of needed fuel and materials. In accomplishing these objectives the cooperatives claim that they do not seek profits, rather they provide supplies to their members at cost, and market the members' products at selling price less cost of selling. Any positive margins that are generated in the supply and marketing processes are returned to the members in the form of patronage dividends. Given that the cooperatives pledge in advance to return such margins to the members, distribution of the margins is said to be nothing more than satisfaction of legal obligations.

Nevertheless, in 1962 when the Internal Revenue Code underwent one of its most substantive revisions, provisions were inserted in the tax code that made all cooperative income subject to taxation. However, special deductions
were permitted for any income that was generated by cooperative members, that is, only income that was judged to be "non-patronage" was taxed.

The investment tax credit was also implemented in 1962, and in a general sense was fully available to cooperatives. Effectively, however, the new credit was not available at all to the majority of cooperatives until the 1978 law change permitted a pass-through of the credit to cooperative members. Most small cooperatives have very little non-patronage income and therefore owe insignificant amounts of income tax against which to apply the credit. Further, the original provisions for the investment tax credit as enacted in 1962 permitted cooperatives to claim the investment tax credit only to the extent that it related to the non-patronage income, with the remainder of the credit expiring immediately. Accordingly, cooperatives as a group were realizing little or no benefit from the investment tax credit; therefore, it could logically be argued that the objectives of that credit were not being achieved in the cooperative segment of the economy. As mentioned earlier, tax legislation in 1978 resulted in substantive changes. A special provision was added to the Internal Revenue Code permitting cooperatives to compute the investment tax credit just as a regular corporation would, that is, on the entire amount of the qualified investment regardless of the amount of taxable income. In addition, any of the credit that is
unused on the tax return of the cooperative itself is now to be passed through to the cooperative's individual patrons. The 1978 tax change effectively reduced equipment acquisition costs for the cooperative membership.

Given the foregoing, and based on a historic intuitive faith in the effectiveness of the investment tax credit even though that faith has not been adequately verified by research, the hypothesis set forth for this study is that capital expenditures qualifying for the investment tax credit in farm supply cooperatives are positively affected (increased) by the availability of that credit.

The final section of Chapter I presents a discussion of possible and probable limitations of this study. One of the more serious problems encountered involves the statistical analysis. Only three years of pre-change (years prior to 1978) data are available for this study. Not only does this short time-frame affect the integrity of the time-series statistical analysis, but also it precludes the use of statistical procedures needed to correct for probable auto-regressive features of the data.

With regard to usefulness of this study, a possible limitation is that the results may not be generalizable to other entities. Given that the cooperative entity is somewhat unique in structure and objectives, the results of this study may not be generalizable to private corporations.
However, the study results should be of value in regard to other cooperatives, especially those involved in agriculture.

Chapter II of this study is devoted to an examination of prior research involving income tax-related incentives for capital expenditures, especially the investment tax credit. The 1967 work of Hall and Jorgenson has had the greatest impact in this area. In that study Hall and Jorgenson concluded that the investment tax credit was highly effective as an influence on the level and timing of capital expenditures (1, p. 415).

Some of the other studies conducted in roughly the same time frame as the Hall and Jorgenson work agreed with their results; others conflicted. A Machinery and Allied Products Institute study done in 1963, for example, concluded that the investment tax credit was indeed effective in achieving its objectives (2, p. 2). Conversely, a study by Woodard and Panichi in 1965 found that the high rate of investment during the time period immediately following implementation of the investment tax credit was not necessarily a result of that credit (4, p. 276). Similarly, Wilson in his unpublished dissertation of 1972 reported that the investments made during 1962 to 1969 would have been made even if the investment tax credit had not been available (3, p. 178). Further, many of the published articles relating to the topic of capital investment incentives...
contain a great deal of controversy regarding the effectiveness of the research models used in the studies involved.

Chapter III of this study presents the research methodology. The data collection process is described in detail, especially the steps involved in selecting the sample of farm supply cooperatives. Farm supply-general and farm supply-petroleum types of cooperatives are included in the sample, having been selected on the basis of geographic location, and on a percentage basis of the totals of such cooperatives in the four upper Midwest states that are in the region served by the St. Paul Bank for Cooperatives.

The principal model developed, labelled as MODEL 1 in this study, uses total capital expenditures eligible for the investment tax credit as the dependent variable. Alternatively, MODEL 2 was constructed identical to MODEL 1 with regard to independent variables; but for the dependent variable MODEL 2 substituted a saved residual that was computed by regressing total capital expenditures, including those that are not eligible for the credit, on the level of expenditures that are eligible for the credit.

Each of the independent variables used in the models are identified and discussed in Chapter III. The company-specific independent variables are (1) debt/asset ratio, (2) local margin (operating income), and (3) net margin (net income). To correct for variance in size of the sampled
cooperatives, the margin variables were scaled by total assets, as were the two dependent variables.

Three general economic variables are included in the models. These are (1) a combined interest/inflation rate, (2) cash receipts from farming, and (3) loan volume of banks for cooperatives. In addition, trend variables 1-9 are included for the nine years of data (1975-1983), as well as a dummy variable (0 for years prior to the tax law change; 1 for post-change years). Finally, interaction variables are included for all the main-effects independent variables except the trend variable, computed by multiplying each of those variables by the relevant dummy value.

A statistical analysis of the results obtained by running the models is presented in Chapter IV of this study. The Statistical Package for the Social Sciences (SPSS) was utilized, and the data was processed at the North Texas State University computer facility. Included in Chapter IV are summaries of both MODEL 1 and MODEL 2 results, showing both simultaneous and incremental values for each of the independent variables, listing them in the hierarchical order in which they were introduced into the analysis. General statistics are also provided.

Statistical analysis of the processed data yields less than satisfying results. The analysis focused primarily on the results of MODEL 1, in that the behavior of capital expenditures that qualify for the investment tax credit are
the primary focus of this study, and those expenditures were represented as the dependent variable in MODEL 1. As stated earlier, the basic hypothesis for this study is that capital expenditures in farm supply cooperatives should respond positively to the availability of the investment tax credit whenever the expenditures are eligible for that credit.

MODEL 1 results do not support the basic hypothesis. As shown in Table III, reported t-values indicate that the dummy variable is not statistically significant. Further, the negative value of that t-ratio indicates that capital expenditures correlate negatively with the availability of the investment tax credit, and of course that is not the behavior expected.

As discussed in Chapter IV, the low coefficient of determination of .1058 provided by MODEL 1 indicates very low explanatory power for that model. The majority of the explanatory power is contained in the debt/asset ratio \( t = 6.713 \), and the positive value of that t-statistic is gratifying in that a positive relationship between the movement of capital expenditures and the debt/asset ratio was expected.

The results of MODEL 1 indicate that both of the other company-specific main-effects variables, those being the local margin and the net margin, are positively correlated with the level of capital expenditures eligible for the investment tax credit. Again, while the confirmation of
such positive correlation is gratifying, unfortunately neither of those variables is statistically significant at the 0.05 level of analysis.

Statistical significance was achieved in regard to some of the interaction variables, indicating that the main-effects variables may be conditioned by the effects of interaction. As discussed in Chapter IV, the behavior patterns indicated by the values of the interaction variables are not consistent with expectations. The results obtained by analyzing the debt/asset ratio interaction effects indicate that the level of capital expenditures eligible for the investment tax credit is lower in the time periods subsequent to the tax law change that made the credit fully available to cooperatives than it is for the time periods prior to the change. Further, the results indicate that the dependent variable is more sensitive to the debt/asset ratio effect before the tax law changed than it is subsequent to the change.

The results of analyzing the net margin interaction effects are also very confusing. Here again the results suggest that the expenditure levels were higher before availability of the tax credit, and in this case there is a change in direction of the correlation, indicating positive correlation between expenditures and net margins before the tax law change, and negative correlation after the change.
Finally, with regard to MODEL 2, the results of running that model are in accordance with expectations. Availability of the investment tax credit should not affect capital expenditures that do not qualify for the credit. However, the extremely low correlation coefficient of .0175 produced by MODEL 2 makes those results extremely unreliable.

Conclusions

As indicated by the analytic results discussed in Chapter IV and in the foregoing paragraphs, this study did not produce any reliable evidence that the investment tax credit positively affects the level of capital investment. On the contrary, the interaction effects that are statistically significant indicate that the level of capital expenditures in farm supply cooperatives may well have been higher, and also more sensitive to changes in the main-effects variables in the time periods prior to the 1978 change in the tax code. In other words, the results of this study indicate that levels of capital expenditures in farm supply cooperatives are negatively correlated with the availability of the investment tax credit, rather than positively related as hypothesized in Chapter I. However, as mentioned earlier, the results of this study are suspect as to reliability because of the extremely low correlation coefficient of 10.5 per cent.
On the matter of speculating as to why the results of this study are statistically weak, it seems rather certain that the causes of the weakness can be traced to one or both of two sources. First, having only three observation points (years 1975, 1976, and 1977) before the point of intrusion (Revenue Tax Act of 1978) may have limited the effectiveness of the research model. Although this study was based on a pooled time-series and cross-sectional analysis of the data, the results will be questioned statistically simply because effective time-series analysis would call for more data points prior to the point of intrusion than the relatively few that were observed in this study.

In regard to this problem of insufficient data points, as explained in Chapter I it simply was not feasible to accumulate company-specific data for time periods earlier than 1975. Given the importance of conducting additional research on the effectiveness of the investment tax credit, this study was undertaken even though it was known that the results might be criticized from a statistical standpoint. It was assumed, however, that the results would be much more explanatory than is indicated by the very low correlation coefficient of .1058.

A very likely second reason why the study results are lacking in explanatory power is that the models contain specification error. The absence of an independent variable to measure the operating capacity of the farm supply
cooperatives under study is very probably the source of the error.

As discussed in Chapter I, there seems to be no practical way of including a capacity factor in the research models for this study. When the models were being developed, thought was given to including either net sales or cost of goods sold as variables representing company capacity, but these ideas were discarded because the income statement values simply do not reflect capacity utilization in any reliable sense that would indicate a need for a farm cooperative to expand or contract operating facilities in response to future demand. Accordingly, it was determined that no reliable measure of capacity utilization was available; therefore, the research model was developed to focus instead on financial measures, namely, debt loads and levels of income. From an intuitive standpoint these financial measurements seemed to be the factors that closely reflect the motivations of farm supply cooperative managers and directors with regard to capital expenditure decisions. As mentioned earlier, the model results do in fact indicate a positive correlation between capital expenditures and debt/asset ratios.

Whether it would ever be possible to adequately specify all the independent variables that affect capital expenditure decisions in farm supply cooperatives is questionable. As indicated earlier, cooperatives are unique business
structures. In some cases the operating manager of the cooperative, an employee, is dominant in both long-term and short-term decision-making; in other cases the cooperative directors are effectively the managers of the business. Presumably the availability of a tax benefit with the certainty of the investment tax credit will always affect investment decisions regardless of the level of management involved, and that of course is the premise taken in this study.

In summary, no positive conclusions can be drawn from the results of this study due to the lack of statistical reliability of the research model employed, and the lack of explanatory power of the model as indicated by very low correlation coefficients. As stated above, it is not feasible to collect the additional data needed to correct the statistical problem, and it is impractical if not impossible to identify and collect the additional company-specific data needed to correct what is likely a specification error.

Recommendations

Additional research is needed if the economic questions regarding effectiveness of the investment tax credit are to be answered. With regard to further study of farm supply cooperatives, however, such research should employ the case study approach. A thorough examination and analysis of approximately ten individual cooperatives, including not
only accumulation of various forms of quantitative data, but also including an assessment of company objectives and strategies, and the dynamics of the management structure in place in those cooperatives, is essential to adequately specify the variables that affect capital expenditure decision-making. The knowledge and experience gained in the process of performing the study of this dissertation strongly indicate that one cannot simply assume that cooperative management will be motivated by the general economic factors that are often considered to be determinants of investment activities. Instead, it is necessary that individual cooperatives be studied on a case-by-case basis to determine the manner in which they respond to changes in the economy, and how they assess their needs for changes in operating capacity.
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